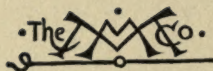








THE INTELLIGENCE OF  
HIGH SCHOOL SENIORS



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# THE INTELLIGENCE OF HIGH SCHOOL SENIORS

AS REVEALED BY

A STATE-WIDE MENTAL SURVEY OF  
INDIANA HIGH SCHOOLS

BY

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OF  
MARY ROACH BOOK



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## PREFACE

AMONG the contributions that the humanistic sciences have made to twentieth century civilization the method and technique of the survey stand preëminent. By survey is meant the measurement of group traits — physical, social, economic, psychological — the quantitative expression of the amounts of these traits found among the members of any group, and the distribution of such traits among members of the group. The survey has been used in the study of many varieties of group life — schools, social communities (urban and rural), industrial and mercantile establishments, and such particular classes of individuals as moral delinquents, for example, and the feeble-minded.

As a result of these surveys much light has been thrown upon the physical, social, economic, and psychological status of groups in which society is greatly interested. We have discovered the true conditions existing in a number of fields and have adopted intelligent means of improving them, such as suitable housing of the poor, sane and curative treatment of criminals, and the classification of school children and college students into homogeneous groups for special educational treatment.

In all these social reforms psychological tests have played a very large and ever increasing part. Though only a few years old, they have been so serviceable in the improvement of various classes and conditions of mankind that when the officials in charge of the education of the

youth of the commonwealth of Indiana wished to discover the intellectual standing of the high school students of the state with a view to providing better means for the conservation and development of individual capacities and talents, they chose the psychological test as their most efficient tool.

The chief purpose of the book is to present in as clear and concise a manner as possible the facts obtained from a rather extensive study of the intelligence of high school seniors and to point out the significance that these facts have, not merely for educators, social workers, and business men, but for all persons interested in the conservation and cultivation of the human resources of the state.

In presenting these facts we have tried to devise a method that would be not merely adequate and reliable for our purpose, but clear and intelligible to laymen, and adapted for use in similar surveys. We have tried to show by an actual example how *extensive* mental surveys may be conducted and to illustrate a method of handling and presenting the results, which may be helpful to those contemplating similar surveys of the human resources of a community or school.

The results of the survey have proved of more than local significance.

1. They are of interest to educators of all communities, who, believing in individualized instruction, desire to inaugurate a *régime* under which they may seek out the peculiar needs and capacities of each pupil and adapt education thereto. The book is, therefore, well adapted for use in teachers' study clubs and for classes in mental measurements.

2. They will interest social workers who see that the social welfare of the individual and the state is closely wrapped up with intellectual endowment, educational opportunity, and the *rapprochement* between the two.

3. They will interest thoughtful men in business and industry who see that the solution of human problems in the industrial world is intertwined with the factors dealt with in this book.

To all these it is hoped that the general method of this survey and the results obtained will prove helpful for the solution of many of the problems that confront them.

The study was made with the authority and full cooperation and aid of the Indiana State Board of Education, which printed the examiner's guide and all blanks used to obtain detailed reports from individual schools. The Board also furnished the postage and clerical help required to arrange for the giving of the tests and for collecting the data. The Department of Psychology at Indiana University prepared the intelligence scale used in the survey, furnished all the test materials, bearing also the expense of making the tabulations.

Arrangements with teachers and high school principals for conducting the mental examinations were made by Oscar H. Williams, at that time High School Inspector for Indiana. He also collected through his office the returns from individual schools. More than five hundred teachers, high school principals, and superintendents took part in making the survey. The author wishes, therefore, to take this first opportunity of acknowledging his great indebtedness to them for their interest, coöperation,



and personal help, and desires to thank the State Board of Education and its president, L. N. Hines, for their coöperation and financial assistance. It is only through such coöperative work that our most important educational problems can be investigated and eventually solved.

The author is indebted largely to the advice and encouragement of friends for whatever merit this work possesses. Dr. S. L. Pressey, Research Assistant in the Department of Psychology, Indiana University, prepared and verified the intelligence scale used in the survey. H. G. Childs, Professor of Secondary Education and H. D. Kitson, Professor of Psychology, at Indiana University, read the entire manuscript and have given helpful criticisms. Without the coöperation, encouragement, and assistance of Mr. Oscar H. Williams, State Supervisor of Teacher Training, this study could not have been undertaken or finished. Mr. Williams not only sensed from the beginning the practical value and importance of the survey, but was chiefly responsible for interesting the State Board of Education and the school officials of the state in the survey. He helped plan the study, write the examiner's guide, and prepare the report blanks and special helps for teachers. He also read the entire manuscript and in ways too numerous to mention has given valuable assistance throughout the study.

Such extensive and hearty coöperation, rare as it is, augurs well for the future of coöperative research of the type recommended and urged in this book.

INDIANA UNIVERSITY

March 1, 1921

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THE INTELLIGENCE OF  
HIGH SCHOOL SENIORS





# THE INTELLIGENCE OF HIGH SCHOOL SENIORS

## PART I

### PURPOSE, METHOD, AND SCOPE OF THE SURVEY

#### CHAPTER I

##### AIMS OF THE SURVEY

IN making this state-wide mental survey <sup>1</sup> of high school seniors the writer had in mind certain definite purposes and problems to guide him in the collection of data and in the organization and interpretation of the results.

**1. Location of the ablest seniors.** The original and chief purpose of the study was to locate by means of reliable intelligence tests the ablest students graduating from the high schools of the state during the year, and to suggest means whereby they might be definitely encouraged to attend college and, if need be, aided financially so that they might continue their education beyond the high school stage. The study was planned and carried to completion on the theory that all high school graduates

<sup>1</sup>Planned and made in collaboration with Oscar H. Williams, State Supervisor of Teacher Training for Indiana, Indianapolis, Indiana.

## 2 INTELLIGENCE OF HIGH SCHOOL SENIORS

who possess exceptional mental endowment should be definitely located and encouraged to continue their education in a college or university.

Nothing contributes more directly to the progress of society and the state than the conservation and proper cultivation of the mental capacities and abilities of the most gifted individuals belonging to each succeeding generation. It is these superior individuals who become the leaders of the race, in government, in industry, in religion, in science, and in art. Their abilities should, therefore, be carefully conserved and fully cultivated.

A few attempts have been made by colleges and universities to attract and serve this special group of individuals. Some universities are giving mental tests to those who present themselves for admission and are using the results of such tests as a basis for the selection of students. All colleges eliminate in the freshman year large numbers of students who are not able or willing to profit by the college work. Such methods enable the colleges to select and retain the best young people who actually apply for admission. They can never become an effective means for locating and selecting the most intelligent individuals unless these superior individuals actually present themselves for admission to college. But by giving an intelligence test to *all* high school seniors just before graduation from high school, it should be possible not merely to locate all individuals eligible for college who possess the highest grades of intelligence, but we should be in a position to encourage and help them complete their education and thus develop for the state their superior capacities and talents.

**2. College intentions of this superior group.** It was planned, in the second place, to ascertain to what extent the colleges are now reaching these exceptionally endowed individuals. Arrangements were made, therefore, to ascertain among other things the exact college intentions of each student graduating from the high schools of the state, in order that we might determine whether or not the colleges were attracting the high school seniors who possess the highest grades of intelligence. We desired to obtain, by making a comparison of the intelligence scores of those actually going to college and those not planning to attend, some idea of the mental strength of the young people whom our colleges actually attract.

**3. Educational direction of the brightest seniors.** It was also believed that a reliable intelligence rating would greatly aid deans and college faculties in directing the educational work of freshmen students. It is an indisputable fact that students with superior mental ability often do only average or even inferior work in college. Students of meager or inferior ability, on the other hand, are often expected by their instructors to do a superior grade of work. To give college authorities information along this line, high school principals were asked to have the intelligence score made by each senior student recorded on the permanent school records and sent with his scholarship standing to the college authorities, if the senior expected to attend college, or to his prospective employer if he intended to go to work. In this way college authorities would secure some idea at least of the grade of work that might reasonably be expected from each freshman student.



## 4 INTELLIGENCE OF HIGH SCHOOL SENIORS

Such intelligence ratings would also give university authorities the necessary data for determining whether the applicant for admission to college had sufficient mental ability to profit by a college course. The purpose and advantages of this plan were carefully explained to the members of each senior class when the tests were given.

**4. Extent to which the high schools and colleges are conserving the mental capacities of this exceptional group of young people.** A fourth purpose in making this investigation was to collect facts that would assist in determining the extent to which the high schools of the state *are* succeeding in adapting their work to the mental strength, interests, and needs of this exceptional group of young people. Are the special capacities and mental abilities of these exceptional students being properly cultivated and conserved? This we hoped to ascertain by a study of the scholastic records made in the past by the entire group of seniors taking the tests; by a study of the extent to which they had been accelerated, retarded, or normally promoted by the school; and by a study of their chief scholastic and vocational interests as indicated by their favorite study in high school and by their choice of an occupation.

**5. Native mental endowment and school success.** It was further desired to study in this investigation the relation that exists between native mental capacity or ability to learn and the scholastic success of the special senior groups examined. We desired to determine the extent to which native mental endowment is indicative of actual performance or success in school and to know whether the

brightest seniors also made the best scholastic record in high school. In a word, to study carefully the relation that exists between the intelligence of high school seniors as indicated by the mental test scores, and the success they achieved in their high school work as shown by the average school marks obtained in all subjects studied during the junior year. An exact correlation between these two conditions was determined and a study made of the factors, other than intelligence, that contribute to an individual's success in school. To get data or material on this problem we studied the records made by these seniors in high school, and we are now studying their intelligence scores as related to the scholarship record they are making in college.

**6. Kind and amount of vocational direction needed.**

One of the most important factors in the conservation and proper cultivation of the mental capacities of this group of superior young people is directing them toward the work in life that is best suited to their mental strength and in harmony with their native interests. We desired, therefore, in this study not merely to get facts that would aid college and university authorities in directing their young people toward lines of work well suited to their mental strength and in harmony with their special capacities and interests, but to ascertain the degree to which the high schools of the state were actually succeeding in their solution of this problem.

It was believed that a reliable intelligence rating would be helpful to school and college faculties in giving their students wiser vocational guidance while they were being

## 6 INTELLIGENCE OF HIGH SCHOOL SENIORS

trained for the duties of life. A reliable intelligence score is, perhaps, the best single criterion for determining the life career for which a student should prepare himself. The grade or type of general intelligence and training required for success in the more important occupations is rapidly being determined by testing those who have made or who are making a success in these fields of work. These norms, when taken together with the scores that high school or college students make on a reliable intelligence test, constitute, we believe, the first essential step in any practical and efficient plan for the *educational and vocational guidance of youth*.

The need for wiser and more efficient vocational guidance of youth is apparent to all. One of the greatest social wastes of to-day is due to the fact that so many men and women are engaged in occupations far beneath the level of their mental ability, while others are attempting work too complex and intricate for their mental strength. Both groups are made unhappy and inefficient by the maladjustment. They often get a wrong or perverted notion about society and government and become socially ill-adjusted because of the faulty economic conditions under which they must work and because their education has been so poorly adapted to their mental capacity and vocational needs. It was hoped to obtain in this survey facts that would serve as a basis for correcting in some measure such social and human wastes.

**7. Democratic appeal of the high school.** Another purpose of the investigation was to gather information showing the success that our high schools are having in reaching

and graduating all classes of our citizenship. The American high school is supposed to be thoroughly democratic and to meet the needs of all classes of people. We, therefore, desired to ascertain whether all occupational and economic classes found in the state had their full quota of representatives in the senior classes of the high school, and whether these schools were ministering adequately to the individual, social, and vocational needs of these various occupational and economic classes. In order to secure data that would enable us to solve this problem we had to obtain information showing the occupational and economic class to which each senior belonged and to correlate these facts with their scholastic and vocational interests shown by their choice of an occupation and their selection of favorite studies in high school.

**8. Mental capacity of seniors coming from different occupational and economic classes.** It was also desired to ascertain the grades of intelligence possessed by the seniors coming from the various economic and occupational classes, in order to determine how the individuals who possessed the highest grades of intelligence were distributed among the various occupational and economic groups represented in the senior classes of high schools; also to determine the relative mental strength of the representatives of these various occupational and economic groups. It has been generally assumed that people naturally group themselves into occupations according to their mental ability; that different grades of mental capacity are required for different lines of work; and that the different economic strata in our society are merely the result of



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differences in mental endowment. It was believed that a careful study of the grades of intelligence actually possessed by the representatives of these several classes would throw much light on such assumptions because it may be assumed that whatever mental differences exist between occupational groups among the people would be reflected in some measure among their children in high school.

**9. Differences between sections, communities, and individual schools.** One of the most important original purposes of the study was to determine by means of reliable intelligence tests any differences that might exist in the mental endowment of the seniors coming from different communities and individual high schools. Systems of high school inspection and accrediting for college entrance have been based in general on the assumption that high schools located in every part of a state should measure up to the same standards of efficiency and achievement regardless of the mental endowment of their students. One of the purposes of this study was to ascertain how the individual high schools of the state compared in the mental strength of their senior classes and to acquaint teachers and school officials with any existent inequalities in the raw human material with which they have to work.

**10. Intelligence of senior boys and girls compared.** Lastly, we desired to make a study of all sex differences that our survey might reveal. Sex differences have been shown to be of special importance when the school achievement of the boys and girls is compared, or when their interests or general and special abilities are considered.

The scores on the intelligence tests made by the boys and the girls were therefore kept separate in *all* the comparisons made in the investigation and the results carefully compared in order that an accurate study might be made of any and all sex differences that the study might reveal.

## CHAPTER II

### MATERIALS AND METHODS

**1. Intelligence scale used.** The battery of tests used in this survey was the Indiana University Intelligence Scale, Schedule D, worked out in the Psychological Laboratory of Indiana University by S. L. Pressey, research assistant in the Department of Psychology. This mental examination consisted of ten separate tests of twenty items each:<sup>1</sup> for (1) rote memory, (2) logical selection, (3) general arithmetical ability, (4) opposites, (5) logical memory, (6) word completion, (7) moral classification, (8) dissected sentences, (9) practical information, and (10) analogies. This scale had been previously verified both as to its reliability for the measurement of intelligence and its validity as a practical instrument for making such a mental survey as is proposed in the present study.<sup>2</sup> Previous to this investigation it had been used in a survey of the school population of an entire

<sup>1</sup> For a detailed description of the intelligence scale used see article by S. L. Pressey, *Journal of Applied Psychology*, September, 1918, pp. 250-269, and study by W. F. Book, "Variations in Mental Ability and Its Distribution among the School Population of an Indiana County," *Proceedings of Fifth Annual Conference on Educational Measurements*, Vol. IV, pp. 130-169, April, 1919, published by Indiana University.

<sup>2</sup> *Journal of Applied Psychology*, September, 1918, Vol. II, pp. 250-269.

Indiana county,<sup>1</sup> and had been given to all grade and high school pupils in three Indiana cities. Earlier still it had been tried out with more than 25,000 high school and grade pupils in Indiana, Illinois, Colorado, Dakota, and New York.

The tests were given exactly as printed in the official Indiana University Scale, except that the time allotted to the tests was reduced in order to adapt them to high school seniors. The first five items in Test 1 (rote memory) and Test 3 (arithmetical ability) were omitted. These items were so easy for high school seniors that they would merely consume time for both pupils and scorers. This reduced the total score that could be made on the tests to 190 points instead of 200, as in the original scale.<sup>2</sup>

The blanks were changed in certain other respects so as to elicit information from the pupils and teachers that would enable us to compare the intelligence scores of high school seniors with certain *social, economic, and educational* conditions which we desired to study. To this end information was obtained on the following points: (1) the age of the student at time of graduation; (2) the number of semesters spent in completing a four-year high school course; (3) the intention of the student to attend college immediately, and the name of the college selected; (4) yearly income of father; (5) the father's occupation;

<sup>1</sup> Book, W. F., "Variations in Mental Ability and Its Distribution among the School Population of an Indiana County," Bulletin Extension Division, Indiana University, Vol. IV, No. 4, April, 1918.

<sup>2</sup> These changes in time and the omission of the ten items from Tests 1 and 3 would so modify the scores made on the tests that the results obtained in this examination should not be compared with the results obtained from the use of our official Schedule D.



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(6) the student's favorite study in high school; (7) the student's choice of a life occupation, if made; (8) the student's scholastic standing in high school in all subjects for the junior year. This information was obtained by teachers from the school records and by requesting the student to answer immediately, before and after taking the mental examination, certain questions printed on the test blank. Arrangements were also made with the principal or teacher giving the examination, to check each of these items on the test blanks and on the official report of the examination sent to the state board of education. Each report was signed by the teacher or principal who gave the examination and graded the papers, and by the school official who certified to the correctness of the final report. The original test papers were returned to the writer with the teachers' reports for verification and study.

**2. Method of giving the tests.** The test blanks were distributed by Mr. O. H. Williams, then high school inspector for Indiana, from the office of the State Superintendent of Public Instruction, Indianapolis, to the principal or teacher who, in response to a previous letter, had indicated his interest in the proposed study and his willingness to coöperate by giving the tests. A printed examiner's guide accompanied by a printed leaflet on "The Value and Significance of Intelligence Tests" was sent with the test blanks to the teacher or principal giving the examination. The examiner's manual contained instructions on the general purpose of the experiment, on the giving of intelligence tests, and on the exact procedure to follow in arranging for and conducting the

examination. It also contained the explicit directions to be given to pupils in each test. It showed how to obtain from the pupils the general information called for on the blanks, and contained a complete set of rules for scoring the papers and for making out the special report to the state board of education.

This final report was made on a specially prepared blank, which, when properly filled out, contained the name of each pupil taking the examination, his record for each individual test, his total score, his age at the time of graduation, the number of semesters spent in completing a four-year high school course, average scholarship record made during his junior year in high school, his father's occupation, father's annual income, college intention,<sup>1</sup> choice of a life occupation, favorite study in high school, etc. This information made it possible to compare the intelligence ratings made by various groups of students separately and with the state standard. It also provided an opportunity for verifying each item in the reports from each school, as the original test papers, together with all facts called for, were returned to the writer for reference and verification.

The tests were all given during the early part of May, 1919, and were given to all senior students of each school on the same day. Because of delay on the part of the

<sup>1</sup> In the column calling for college intention the teacher or principal making out the report was asked to write the name of the particular college the pupil expected to attend if a choice had been made, the word "yes" if he was going to college, but had not made a choice of college; the word "no" if he stated that he did not expect to go to college. All this information was contained on the pupil's mental test blank and was verified by the writer.

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state board of education in arranging for the investigation, the blanks did not reach some of the smaller schools in time for them to give the examination before the end of the school year. But 320 commissioned high schools in the state gave the examination to their senior classes, which varied in size from 2 to 276 pupils. There were in these high schools a total of 6188 senior students who took the examination — 2477 boys and 3711 girls. In a few schools the entire senior class was not present on the day the tests were given, but from about 98 per cent of these schools a 100 per cent record was obtained from their senior classes.<sup>1</sup> Two large and three small high schools did not return their reports in time to be included in all tabulations. Their results were used only in making the comparison between communities and schools and in the computation of the state standard. For all other comparisons made in this study the reports from only 5748 students were used, 2306 being boys and 3442 girls.

**3. Scope of the survey and nature of the results.** As may be inferred from our statement of aims and the description of methods, the results of this investigation bear directly upon a number of problems far reaching in educational and social significance, which serve as chapter headings in Part II of this study. These problems may be briefly set forth as follows :

(1) The general level and range of intelligence of Indiana high school seniors, shown by the range and distribution of the scores made on the intelligence test.

<sup>1</sup> A check on this point was obtained by having each school report the total enrollment of its senior class and the number of boys and girls who took the examination.

(2) The intelligence of the seniors going to college, obtained by making a comparative study of the intelligence scores made by the seniors (*a*) going to college, (*b*) those not going to college, (*c*) those going to a liberal arts college, (*d*) those going to a professional or technical college, (*e*) those going to college, with no college selected.

(3) The intelligence of seniors whom the high school has accelerated, retarded, or regularly promoted, obtained by comparing and contrasting the intelligence scores of those graduating from a four-year course in 6, 7, 8, 9, 10, 11, or 12 semesters.

(4) The intelligence of seniors who had been accelerated or retarded at some time during their entire school course, obtained by comparing the record made on the tests by those who graduated from high school when they were 15, 16, 17, 18, 19, 20, and 21 to 27 years of age.

(5) The intelligence of seniors making an excellent average, or a poor scholastic record in high school, shown by correlating with his intelligence score the average scholarship record made by each student in all subjects studied during his junior year in high school.

(6) The intelligence of seniors selecting different occupational careers, obtained by distributing the total group of seniors on the basis of the life occupations selected, and (*a*) comparing the intelligence scores made by the group which had selected a life occupation with the scores made by the group which had not, and (*b*) comparing the scores made by the groups that selected different standard occupations.

(7) The intelligence of seniors pursuing different courses



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in high school — the academic, scientific, classical, general, college preparatory, commercial, and vocational — obtained by comparing the intelligence rating made by seniors pursuing each of these seven courses offered by the high schools of the state.

(8) The intelligence of seniors preferring different high school subjects, obtained by asking each senior to indicate his favorite study in high school, and by comparing the records made on the mental tests by those electing different subjects with each other and with the state standard.

(9) The intelligence of seniors belonging to different occupational classes, obtained by distributing the intelligence scores of our total group according to the occupations of their fathers and comparing and contrasting with the state standard the intelligence ratings made by seniors belonging to these several occupational groups.

(10) The intelligence of seniors coming from different economic strata in our society, obtained by redistributing our total group of seniors according to the earnings of their fathers and comparing the intelligence ratings made by those belonging to different economic groups.

(11) The intelligence of seniors coming from different communities and schools, obtained by comparing the intelligence ratings of the seniors coming (a) from different sections of the state, *i.e.* the northern, central, and southern sections; (b) from different sized high schools in each section; (c) from different types of communities, *i.e.* mining, agricultural, manufacturing, and urban; (d) from schools situated in the most fertile and in the least productive sections of the state; (e) from schools of the

same size, located in the same city, county, or section of the state.

(12) Important sex differences were also revealed for the various groups compared, by keeping separate in all our tabulations the records made by the boys and the girls.

Each of these problems will be dealt with in Part II of this book, devoted to a presentation and interpretation of the results of the survey.

## PART II

### PRESENTATION AND EXPLANATION OF RESULTS

#### CHAPTER III

##### INTELLIGENCE OF HIGH SCHOOL SENIORS

THE first problem set by the survey was to ascertain by reliable measurement: (1) the general level of intelligence found among high school seniors, (2) the range of intelligence or grades of mental endowment found among this select group, and (3) the relative frequency with which various grades of intelligence occur among the individuals of this special group.

**1. General level of intelligence of high school seniors.** Since it is impossible to measure absolute mental ability, because no intelligence scale can be constructed which will give us an actual zero point of intelligence to start from, and since any group of individuals reveal many different grades of mental ability, the general level of intelligence of any group must be measured by standards obtained from the group itself or by standards obtained from other groups of individuals whose intelligence rating is known. High school seniors represent a highly selected group of individuals who have heretofore not been measured. We, therefore, do not have norms from a similar group

with which to compare our results. Neither do we have norms for our scale from an unselected group of adults. The most reliable index of the general level of intelligence of this special group of individuals will, therefore, be the central tendency or median score made by the total group and the range in score for the middle 50 per cent, which indicates not merely the median for the total group, but the middle points in the distribution of scores above and below this median score.

The median score for our total group was 137 points out of a possible score of 190. The median score for the boys was 138.9 and for the girls 135.8. The total range of scores extended from 40 to 187 points. The middle 50 per cent of the group made scores ranging from 124 to 148 points. (See distribution curve, Figure 1.)

**2. Range of intelligence among high school seniors.** The various grades of intelligence which high school seniors possess are indicated by the range in score *above* and *below* the median for the total group, and by the distribution of scores *above* and *below* this central point. Table I, containing the percentile scores for the entire group and for each sex, shows that while the median score is 137, 50 per cent of the students made scores between 124 and 148 points; 10 per cent made scores above 158; the highest 5 per cent made scores above 164; while the highest 1 per cent made scores ranging from 176 to 187 points. The poorest 10 per cent of the total group made scores below 111 points; the lowest 5 per cent fell below 102; while the lowest 1 per cent made scores ranging from 40 to 81 points.



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TABLE I

## PERCENTILE SCORES FOR THE TOTAL GROUP

Percentile groups.....	1	5	10	20	25	40	50	60	75	80	90	95	99	CASE
Score for total group .....	81	102	111	121	124	131	137	142	148	151	158	164	176	6188
Score for boys.....	80	102	112	122	126	134	139	143	150	153	160	165	177	2477
Score for girls.....	83	101	110	120	123	131	136	141	147	150	157	163	175	3711

A clearer, and perhaps more accurate, idea of the different grades of mental ability possessed by these high school seniors may be obtained by ascertaining the percentage of individuals whose test scores place them in definite sectors of the total distribution. If we divide the total range of scores, *above* and *below* the median, into sectors of equal length and calculate the percentage of individuals whose test scores place them at these different levels of the total distribution, we secure not only an indication of the different *grades* of intelligence which our total group possessed, but we obtain a method which will enable us to determine the frequency with which each of these grades of intelligence occurs in our total group. If, then, some specific designation be given to each of these grades of intelligence, we have a method which enables us to compare any particular group of individuals with our state standard and with any other group. This method will also enable us to ascertain the extent to which these same grades of mental ability occur in any desired regrouping of these same individuals. We are enabled also to determine the relative frequency with which these different grades of intelligence occur in a given group, and so to draw definite con-

clusions regarding their presence or absence and their relative frequency of occurrence in any reclassified group which we may wish to study or compare with our state standard.

With these ends in view we divided the total range of scores made by our total group into steps representing an  
Percent

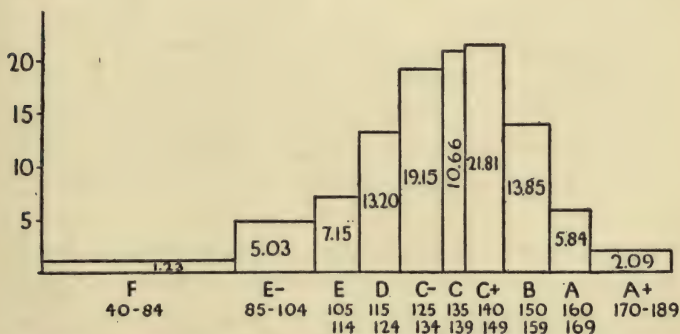


FIGURE 1.— Distribution of the grades of intelligence possessed by our total or standard group of high school seniors. (The "C" sector in the curve is narrowed in width and increased in height to show proper proportion.)

increase or decrease in score of ten points *above* or *below* the median score for our total or standard group. A distribution curve drawn on this basis is shown in Figure 1, and indicates the relative frequency with which each of these grades of intelligence occurred in our total group. To facilitate making the necessary calculations in our comparisons, we considered the middle sector (135 to 139 inclusive, two points on either side of the median) as a separate unit, and made regular gradations above and below this point.

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As may be seen from an inspection of this distribution curve, the range in score extends farther *below* than *above* the median. The steps in our total distribution are, for sake of clearness and ease of comparison, designated by the letters, A<sup>+</sup>, A, B, C<sup>+</sup>, C, C<sup>-</sup>, D, E, E<sup>-</sup>, and F, beginning with the highest sector or intelligence rank and continuing to the lowest. The score value of these steps or grades of ability and their relative frequency in our total group is shown in Figure 1. In the remaining sections of this report these variations in test score will, for the sake of convenience, be referred to as A, B, C, D, E, or F grades of intelligence for high school seniors, signifying the variations in mental ability suggested by these differences in total score.<sup>1</sup>

The steps in our distribution curve, above and below the median, are of equal length until the highest and lowest ranges are reached. This does not indicate, however, an equal amount of increase or decrease in intelligence. Our scale is not so constructed and cannot be so constructed as to give equal value to each of these sectors. The absolute value of these different grades of intelligence is unknown. But notwithstanding this fact, we may give them a label and make definite statements regarding their presence or frequency in any subgroup of these same individuals which we might desire to study and compare

<sup>1</sup> These intelligence grades for high school seniors should not be confused with the intelligence ratings obtained in the army. The army tests were given to an *unselected* group of adults. Our mental tests were given to a highly selected group of adults. Consequently an A rating for high school seniors indicates an entirely different grade of general intelligence from an A rating obtained by the use of the army scale, as is explained farther on in this report.

with the state standard. The method gives us not only a state standard for our measurements, but a means for making convenient and reliable comparisons between the various groups of seniors which we desired to study in this investigation.

### 3. Number of seniors at the various intelligence levels.

To determine the relative frequency with which these different grades of intelligence occur among the individuals in any particular group we need only ascertain the percentage belonging to the group whose test scores place them in standard sectors of our total distribution. These percentage amounts are shown in Figure 1 and Table II.

TABLE II

PERCENTAGE OF HIGH SCHOOL SENIORS POSSESSING EACH GRADE OF INTELLIGENCE

Intelligence											
grades	. . .	A <sup>+</sup>	A	B	C <sup>+</sup>	C	C <sup>-</sup>	D	E	E <sup>-</sup>	F
Per cent of total											
group who made											
each grade on the											
tests	. . . .	2	6	14	22	11	19	13	7	5	1

### 4. Probable value of these several grades of intelligence.

The significance of these various grades of intelligence may be discerned if they are translated into terms which have been used to describe the variations in intelligence found among the members of an unselected group of adults. In evaluating the results obtained by the use of the army mental tests individuals were divided into the following seven classes:<sup>1</sup> (1) those possessing a *very superior* or

<sup>1</sup> Compare Army Mental Tests, Washington, D. C., November, 1918, pp. 6-7.



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"A" grade of intelligence; (2) those possessing *superior* or "B" grade of intelligence; (3) those possessing a *high average* or "C+" grade of intelligence; (4) those possessing only *average* or "C" grade of intelligence; (5) those possessing a *low average* or "C-" grade of intelligence; (6) those possessing an *inferior* or "D" grade of intelligence; (7) those possessing a *very inferior* or "E" grade of intelligence, depending upon the position in which the individual's mental test score placed him in the total range of scores.

It may be further assumed, as has been determined by actual experiment, that individuals with *very inferior* mental ability (the lowest 8 or 10 per cent of any unselected group of adults) are mentally deficient, or border-line cases, belonging to the higher grades of feeble-minded, who have not been committed to institutions for the mentally deficient. Those with *inferior* intelligence, the next 15 per cent, are rarely able to go beyond the third or fourth grade in our elementary schools no matter how long they attend. Individuals with a *low average* or C- grade of intelligence may possibly finish the elementary school grades, but rarely if ever go on to high school.<sup>1</sup> This would leave for the high school only the individuals who possess *average* (C), *high average* (C+), *superior* (B), and *very superior* or A grades of intelligence. Since those with only average intelligence are rarely capable of completing a high school course, we may conclude that the high school *seniors* which we tested would fall, in the main, in the *high average*, *superior*, and *very superior*

<sup>1</sup> Army Mental Tests, Washington, D. C., November, 1918, pp. 6-7.

groups if measured by a standard obtained from a large group of *unselected adults*. Those who made scores on our tests which place them in the lowest 5 or 10 percentile group would therefore possess (because they are seniors in high school) at least *average* intelligence if measured by a standard obtained from an unselected group of adults.

The various grades of intelligence possessed by high school seniors must therefore be thought of as further variations of these higher rankings of unselected adults.

It would be helpful if we had norms for our scale from such an unselected group of adults with which to make our comparisons. It would be better still if we had an absolute scale for measuring intelligence, so that we might determine where in this scale of absolute values our group would stand between the lowest, or zero grade of intelligence, and the highest possible grade. But lacking such an instrument or standard, we can make comparisons in this report only in terms of standards obtained from our own *selected* group, remembering the probable position in a normal scale of distribution which this group occupies, and what the inequalities in mental ability possessed by this group really mean when translated into terms of a normal distribution. And since our group is composed exclusively of those who have successfully completed a high school course, we may infer that we tested only the equivalent of a few adults with *average* intelligence, and possibly only the best of the group possessing *high average* intelligence. The rest of our seniors, if thought of in terms of a standard obtained from an unselected group of adults,

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would doubtless possess *superior* and *very superior* grades of intelligence.<sup>1</sup>

It should therefore be borne in mind, in considering the results of this study, that the individuals in our selected group whose test scores place them in the highest sectors of our total distribution, represent in all probability the *very best* individuals intellectually, of those who in an unselected group would be classed as *very superior*. This much is certain. They are the best of this original group of *superiors* as far as the high school is able to select and conserve them. *It is the brightest individuals of this highly selected and in all probability specially gifted group that we wished especially to locate by means of this investigation so that they might be assisted and encouraged to continue their education in a college or university.*

<sup>1</sup> The American public schools, though the most democratic in the world, are, notwithstanding, a very effective selective agency, which tends to conserve only the best by the constant elimination of the most unfit individuals belonging to the total social group. This selective feature of our educational system is often overlooked.

## CHAPTER IV

### INTELLIGENCE OF HIGH SCHOOL SENIORS GOING TO COLLEGE

ONE of the original purposes of this investigation was to locate, by means of intelligence tests, the brightest seniors graduating from the high schools of the state in order that they might be encouraged and, where necessary, aided financially, to attend a university. In order to arrange for the conservation of the talents of this specially gifted group our first task became that of ascertaining the intelligence of the seniors who were actually planning to go to college, in order to see to what extent our colleges and universities are already attracting the ablest individuals eligible to enter higher educational institutions.

As already stated, each student taking the intelligence tests was required to indicate on his test blank his exact college intention. In case this information was not reported, or was incomplete, the teacher giving the test obtained it privately and reported it. The tabulations were then made in such a way that a comparative study could be made of the intelligence scores of the following groups: (1) those definitely planning to attend a college or university immediately; (2) those who stated that they never expected to attend a college or university; (3) those who intended to attend college but who had not yet decided what college to attend; (4) those selecting an engineering



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or professional school;<sup>1</sup> (5) those selecting a college of liberal arts. The mental tests given to all classes of men in the army showed that engineers rated distinctly higher on the army intelligence tests than did any other occupational group. We were interested, therefore, not merely in ascertaining whether the brightest students graduating from Indiana high schools were planning to attend college, but in determining what sort of college they expected to attend.

The distribution tables for the two groups of seniors mentioned first showed that when each of these groups was compared with our total or standard group there seemed to be about as many individuals among the group "going to college" whose test score placed them in the lower sectors of the distribution as there were in the group "not going to college"; and, conversely, there seemed to be about as many in the group "not going to college" whose test scores placed them in the higher sectors of the distribution as in the group who had definitely decided to attend college. In other words, there were individuals in both groups who possessed each grade of intelligence from the highest to the lowest. Therefore, the only way to compare adequately the intelligence of these several groups was to ascertain the general level of intelligence possessed by each group and to calculate the percentage of individuals belonging to these several groups who possessed each grade of intelligence found among the individuals of our total or standard group.

<sup>1</sup> This group includes those selecting a normal or teachers' training school as well as a professional or engineering college.

1. **General level of intelligence of the seniors going to college.** The general level of intelligence possessed by the seniors belonging to the several groups compared in this section is indicated, first of all, by the percentage of individuals belonging to each group who made scores on our tests above the median for our total or standard group. These figures, given in Table III, show that the seniors who were planning to attend college rank somewhat higher than those who stated that they never expected to attend. Those who had decided what college they would attend rank higher than those who had not selected their college. Those expecting to attend an engineering or technical school rank slightly higher than any other group.

TABLE III

PER CENT OF GROUPS WITH DIFFERENT COLLEGE INTENTION  
WHO MADE SCORES ABOVE THE STATE MEDIAN

GROUPS COMPARED	WILL ATTEND					CASES
	College	No College	College Liberal Arts	Technical College	No College Selected	
Sexes combined .....	51.74	46.41	57.02	58.98	47.10	5748
Boys.....	56.07	47.47	59.02	59.49	51.92	2306
Girls.....	48.37	45.91	55.92	53.34	44.93	3442

A second indication of the general level of intelligence of these several groups may be obtained from a comparison of the percentile scores for each group. The 1, 5, 10, 25, 40, 50, 60, 80, 90, 95, and 99 percentile scores were calcu-

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lated for each of the five groups of seniors compared and curves drawn for each group. These percentile curves show (see Figure 2) that the students going to college rank slightly higher at all levels of ability than the group that did not expect to attend; that those selecting a college

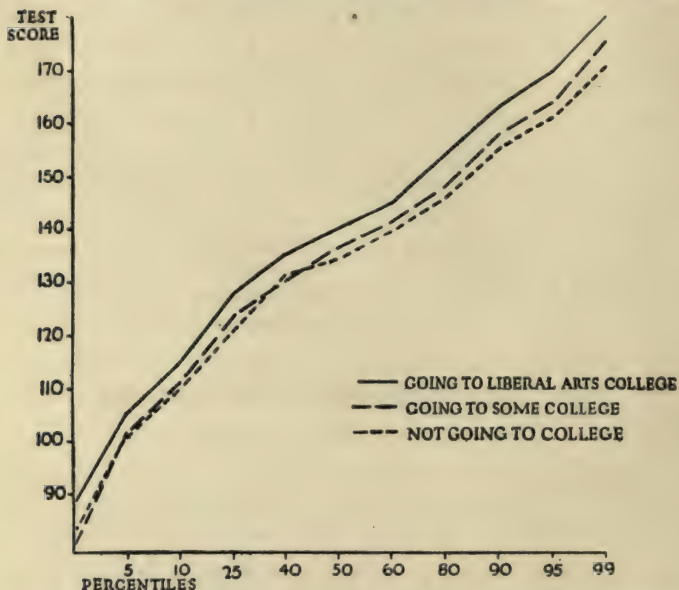


FIGURE 2. — Curves showing scores obtained by various proportionate groups of seniors: (1) going to college, (2) not going to college, (3) going to a college of liberal arts.

of liberal arts rank consistently higher at every level of intelligence than any other group; that the curve for the group which expected to attend college but which had not decided what college to attend passes below the curve for the group not expecting to attend, at the lower levels of

ability, and slightly above it at the higher levels, due, no doubt, to the fact that many girls possessing the lower grades of intelligence stated that they expected to attend college when they meant a so-called commercial college.

The best indication, however, of the general level of intelligence of these various groups is given by the data contained in Figure 3, showing the record made by the middle 50 per cent of seniors belonging to each of the five groups

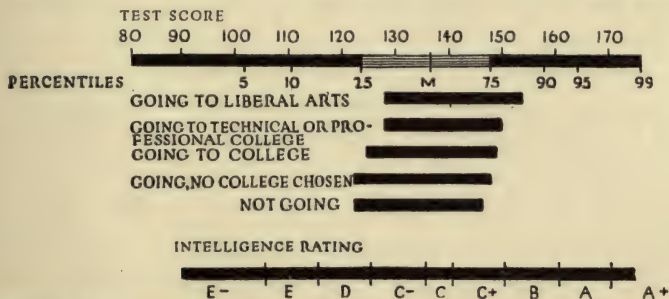


FIGURE 3. — Scores obtained by middle 50 per cent of seniors with various college intentions. The scale at the top of the figure gives range in score for our standard group divided, by vertical cross-bar, into percentile groups. Scale at bottom shows corresponding grades of intelligence.

compared in this chapter. The record made by the middle 50 per cent of our total or standard group is indicated on the scale at the top of the figure. The scale at the bottom shows the score value of the various intelligence ratings. The horizontal bars indicate the scores made by the middle 50 per cent of seniors belonging to the various groups compared. The vertical lines crossing the bars indicate the median scores for each group.

As may be seen from an inspection of the figure, the



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median score and record for the middle 50 per cent of the group planning to attend a liberal arts college is higher than that for any other group. The group not going to college ranks lowest. The other groups rank in between. The group which will not attend college and the group expecting to attend college, but not having selected their college, both rank below our total or standard group.

**2. Number of seniors going to college, who score at the various intelligence levels.** The relative frequency with which each grade of intelligence possessed by our total or standard group was found among the group going to college, or in any of the other groups compared with it in this section, may be determined by calculating the percentage of individuals belonging to these various groups, whose test scores place them in the different standard sectors of our total distribution. From our distribution tables the percentage of individuals possessing each grade of intelligence from A<sup>+</sup> to F, inclusive, was calculated for each of the groups compared in this section. These results were then expressed by means of curves indicating the relative frequency of the several grades of ability possessed by each group. (See Figures 4 and 5.)

Figure 4 compares the various grades of intelligence possessed by the seniors going to a college of liberal arts with those possessed by the group not going to college. As may readily be seen from an inspection of these distribution curves, the group going to colleges of liberal arts is distinctly superior to the group not going to college, in the percentage of individuals rated A<sup>+</sup>, A, or B. The

group not going to college also has a larger proportion of individuals rated D, E, and F. This is shown by the fact that for the higher levels of ability the curve for the group expecting to attend a liberal arts college passes above the other curve, while for the lower levels of ability

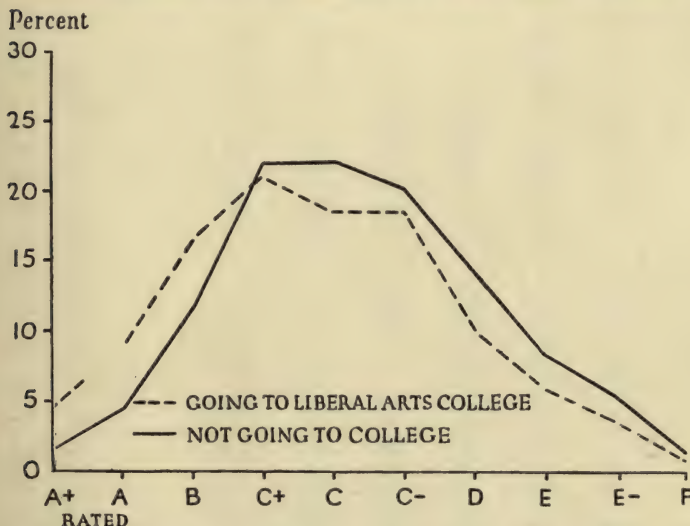


FIGURE 4. — Frequency curves for seniors (1) not going to college, and (2) going to colleges of liberal arts, showing the percentage belonging to each group who possess each grade of intelligence found among high school seniors.

it passes below the curve for the group not going to college. The curves for those who had not decided what college they would attend and those who expected to attend a professional or technical school are not shown in the figure. If drawn, they would pass about midway between the curves shown in the figure.

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Figure 5 compares the grades of intelligence possessed by the group going to colleges of liberal arts with those possessed by the group going to a professional or technical school. A mere glance at these curves will show the superiority of the liberal arts group for the higher grades of ability.

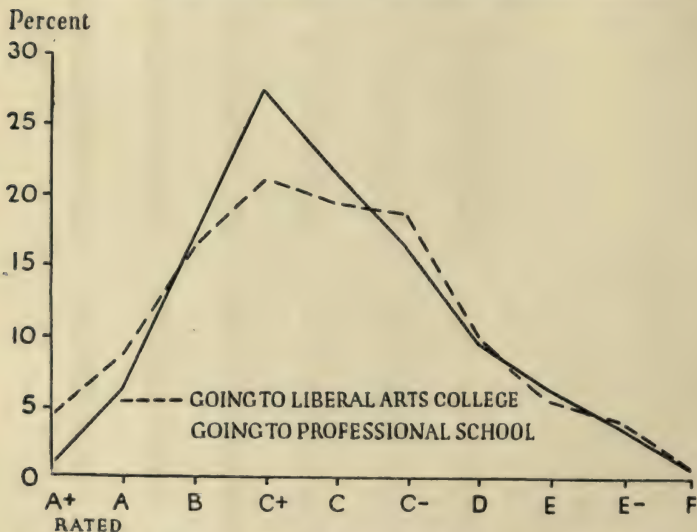


FIGURE 5. — Frequency curves for seniors going (1) to colleges of liberal arts, (2) to a technical or professional school. Curves show the percentage belonging to each group who possess each grade of intelligence found among high school seniors.

This curve rises above the curve for the technical group at the points indicating an A+ or A grade of intelligence. But for the C+ and C grades the curve for the technical group rises far above the curve for the liberal arts group, showing that a larger percentage of individuals belonging to the latter group possess this grade of

intelligence. This fact makes the percentage of individuals belonging to this technical group, who make

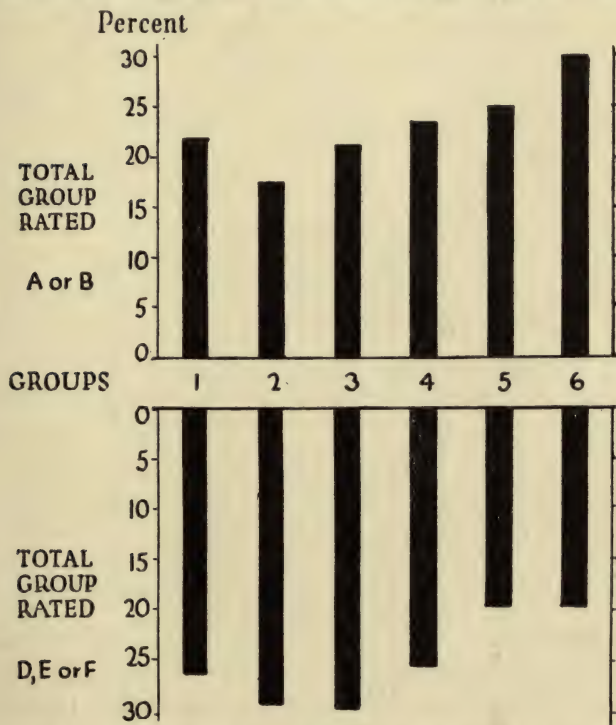


FIGURE 6. — Percentage of seniors possessing the highest (A or B) and the lowest (D, E, or F) grades of intelligence in the following groups: (1) our total or standard group; (2) all who will not attend college; (3) those expecting to attend college, no college selected; (4) all who expect to attend college; (5) those expecting to attend a technical or professional school; (6) those expecting to attend a college of liberal arts.

scores above the state median, higher than is the case for the liberal arts group. (Compare Table III, page 29.)



The other grades of intelligence are about equally distributed in the two groups.

**3. College intentions of the brightest and dullest high school seniors found in the state.** From the data presented in Figures 4 and 5 it appears that seniors possessing the higher grades of intelligence are slightly more likely to attend college than the seniors who possess the more inferior grades. This fact is strikingly shown in Figure 6, which pictures the percentage of seniors belonging to the several groups compared in this section, who were rated A or B and D, E, or F on the intelligence test. Each of our five groups is here compared with our state standard and with each other on the basis of the percentage of students belonging to the group who were rated A or B and D, E, or F. Figure 7 shows the sex differences which occurred within each of these groups.

These results show clearly that the brighter students are a little more likely to attend college than those possessing mediocre and inferior grades of mental ability; that the seniors with the most superior grades of intelligence are slightly more likely to go to college than not to attend; and that the brightest students are more likely to go to colleges of liberal arts. *But the very significant fact that there are about as many individuals of mediocre and inferior grades of intelligence going to college as students rated A or B is not emphasized by these results.*

This fact is shown in a striking manner in Figure 8. Figures 6 and 7 have already shown that a large percentage of individuals in the group not going to college are rated A or B and conversely, that there are almost as many

individuals rated D, E, or F in the groups going to college as seniors possessing the higher grades of ability. Figure 8 shows the per cent of students possessing each grade of intelligence (A<sup>+</sup> to F) who are (1) going to college, no college selected; (2) going to a liberal arts college; (3) going to a professional or technical school; (4) the per-

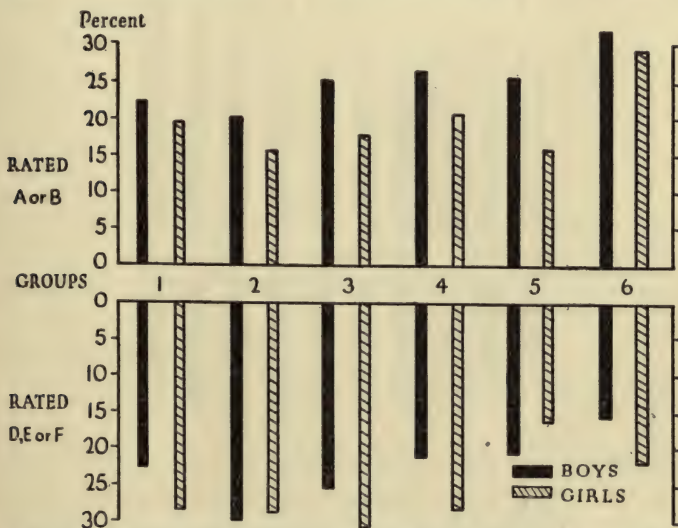


FIGURE 7.— Same groups compared in Figure 6 distributed according to sex.

centage not going to college. A mere glance at this figure will reveal the fact that 22 per cent of all students rated A<sup>+</sup> are not even thinking of going to college; that 24 per cent of the students rated A are not going to college; that of those rated B and C<sup>+</sup> 28 and 33 per cent respectively do not intend to go to college; but that 71 per cent

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of the students rated F, 68 per cent of the total group rated E-, 62 per cent of the group rated E, and 64 per cent of the group rated D are definitely planning to attend a col-

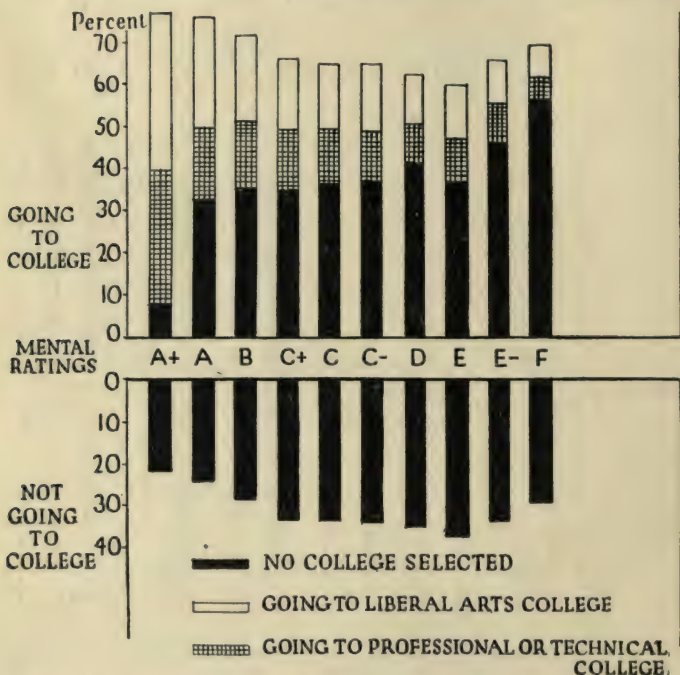


FIGURE 8.—College intention of high school seniors possessing each grade of intelligence—shows the percentage belonging to each intelligence group who are, (1) going to college, (2) not going to college, (3) going to college, no selection made, (4) going to a college of liberal arts, (5) going to a technical or professional college.

lege or university as soon as they graduate from high school. Many of these most inferior high school seniors have their college already selected, as is indicated by the shadings in

the figure. The kind of college which these seniors will attend is indicated by the different styles of shading on the bars representing the group.

**4. General summary of facts.** The outstanding facts revealed by this comparison of the intelligence scores made by seniors with different college intentions are the following :

1. High school seniors with all grades of mental ability, from the lowest to the highest, are going to college in about equal numbers. Almost as many students possessing E and F grades of intelligence are going to college as merit a ranking of A<sup>+</sup> or A.

2. Many of the brightest students graduating from our high schools are not planning to go to college at all. Of those rated A<sup>+</sup>, 22 per cent stated they never expected to attend a college or university. Of those rated A, 24 per cent did not intend to continue their education beyond the high school. Of those rated B, 28 per cent did not expect to go to college.

3. Many students, on the other hand, with the lowest grades of intelligence are definitely planning to go to college, many of them having already selected the college they expect to attend. Of those ranking D and E, 64 and 62 per cent, respectively, stated that they would attend college next year. Only 78 per cent of the seniors ranked A<sup>+</sup> stated that they were going to college.

4. Taken as a whole the students who have decided to go to college rank slightly higher on the intelligence tests than do those who have not. Those selecting a college of liberal arts rank higher than any other group.



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Those who have selected a definite college to attend rank higher than those who have not decided where to go.

5. The brightest students, those rated A<sup>+</sup>, A, or B, are slightly more likely to go to college than those whose test scores placed them in the middle or lower intelligence grades. (Compare Figures 4, 5, and 8.)

6. The more intelligent the student the more likely he is to have selected the college he will attend (see shadings in Figure 8), and to attend a college of liberal arts. A greater proportion of students rated A<sup>+</sup> or A select a college of liberal arts, while more students rated C<sup>+</sup> and C are planning to go to a professional or technical school, as may be seen by the crossing of the curves in Figure 5. This fact makes the per cent of the latter group scoring above the state median slightly higher than for the liberal arts group.

7. For every level or grade of intelligence the boys rank higher than the girls. These sex differences hold for all groupings made in this section. The higher the grade of intelligence the greater is the percentage of boys. (Compare Figure 7 and Chapter XIII.)

**5. Discussion and interpretation of results.** From the facts revealed in this section, it is clear that students with every grade of native mental endowment possessed by high school seniors enter our colleges and universities each year. Moreover, there are about as many seniors going to college who possess mediocre grades of intelligence for high school seniors, as those who possess the most superior grades. What quality of work should be expected from college students who vary so greatly

in mental capacity? How may intelligence tests or reliable mental ratings assist college authorities in giving to these young people the kind of educational direction and guidance that they need?

(a) *Readjustments are needed.* If, as we may assume, individuals possessing a superior or B grade of ability, when measured by a standard obtained from a normal group of unselected adults, are capable of making a good record in college, we may safely conclude that any high school senior who makes a score above the median or average score for our total or standard group is capable, so far as native mental ability is concerned, of doing good work in college. If he makes a score very far *above* this *middle point* in our state standard, we may conclude that he has the mental capacity to do *superior* work as a freshman in college and should be expected to do so.

But since the results given in this chapter clearly show that high school seniors with all grades of mental ability are planning to attend college in about equal numbers, we must conclude that many individuals will and do attend college who cannot do average or first-class work unless college standards are adjusted to the intellectual level of such students as actually attend. College authorities and instructors should not expect the same quantity or quality of work from students who vary so greatly in native mental endowment. They should, on the other hand, use the knowledge that has been obtained concerning these differences in intelligence and adjust their work thereto. One of two things might be done. If high school seniors possessing all grades of intelligence are admitted indis-

criminate into our colleges and are definitely encouraged to attend, as is now the case, some arrangements should be made for grouping these students into classes or sections on the basis of mental strength so that the problem of instruction might be facilitated and the superior students given the kind of opportunity and assistance which their special ability demands.

If, on the other hand, the chief function of our colleges and universities is, as many believe, to train leaders for society in all lines of human endeavor, special provisions should be made for teaching these most gifted individuals, and providing the kind of education that is most helpful to them.

(b) *Practical value and need of the mental survey.* According to our results about 25 per cent of the students possessing the highest grades of intelligence found among high school seniors are not even thinking about attending college, while about 65 per cent of those possessing the lowest grades of mental ability are definitely planning to attend the higher educational institutions of the state. What can be done to encourage and help the former class to make the most of their superior mental capacities and talents? And how can the latter group be directed in a way that will enable them to find the work in life that is best suited to their native mental strength? It may be questioned whether those with only average or meager native mental endowment should be definitely discouraged from attending a college or university, but every one would doubtless agree that all who possess superior intelligence should be definitely located and given whatever help and

encouragement is needed to induce them to continue their education until they are properly and fully trained. For the solution of this problem a mental survey would prove helpful in the following ways:

(1) A state-wide mental survey of high school seniors would enable us to *locate* this superior group of young people and hence prepare the way for giving them such encouragement and help as they may need to make them continue their education in college. Giving those who actually present themselves for admission to college an intelligence test and using the results of such tests as a criterion for admission to college will never suffice, for the simple reason that 25 per cent of the most brilliant seniors in our high schools are not even thinking about going to college.

(2) A little careful experimentation made in coöperation with the colleges and universities would, we believe, soon reveal a point on the intelligence scale below which students should be definitely discouraged from entering a university. The scholastic record made by former senior students now attending the colleges of the state is being investigated and correlations established between their intelligence scores and college grades. The next problem to attack is to establish a point on some practical and reliable intelligence scale below which high school students should be definitely discouraged from entering college. This would tend to reduce the congestion in our universities by limiting attendance to those who possess the mental qualities required for leadership in every field.

(3) Such a mental survey might also be extended



downward to the seventh and eighth grades to ascertain whether our high schools, as now organized and conducted, are really attracting and our elementary schools conserving the brightest pupils who enter the public schools. It may be that children with the best native mental endowment, for pecuniary or other reasons, are not even attending our high schools. The facts should be determined and proper adjustments made.

(4) A mental survey is also needed if we would give these young people the right sort of educational and vocational guidance in high school and college. One of the greatest social wastes to-day is due to the fact that so many men and women, because of present economic conditions or lack of proper direction, are engaged in occupations far beneath their level of ability, while others are attempting work too complex for their mental strength. Both groups are made unhappy and inefficient by the maladjustment. In our educational work we are ignoring most of these facts. Much of our work is too general and aimless to be effective. And a bad condition is made worse when we attempt to train young people in professional and vocational schools for careers wholly unsuited to their mental strength. Systematic mental surveys would do much to correct such social wastes. If such surveys were made of the workers now engaged in standard occupations, they would soon reveal the level of intelligence which successful workers in every field actually possess. This would provide norms that would give us at least a starting point for the effective vocational and educational guidance of youth.

(5) Systematic mental surveys would also help us to determine why students with superior intelligence often do only average or mediocre work in high school and college and sometimes fail in life, while students with only average intelligence often succeed. They would also soon get us in the habit of not expecting an 'A' grade of school work from students possessing an E or F grade of intelligence and would make us adapt the work of the high school and college better to the marked inequalities in mental ability found among our students.

Other values of the mental survey will be pointed out in Chapter XVI.

## CHAPTER V

### INTELLIGENCE OF SENIORS WHO HAVE BEEN ACCELERATED, RETARDED, AND REGULARLY PROMOTED BY THE SCHOOL

WITH the discovery that marked individual differences exist among children of the same age or children belonging to the same school grade (differences in endurance or vital capacity, in native mental endowment, in the number and kind of special mental abilities possessed) there has grown up a widespread belief that progress in learning should take place in direct proportion to the native mental endowment which a given individual or group of individuals possesses; that educational accomplishment should be commensurate with intelligence or at least be measured in terms of the native mental endowment of the child or group whose school achievement is being measured. A number of psychologists are attempting to devise methods whereby this may be successfully done.<sup>1</sup>

On this theory we would naturally expect the schools of the state, if they had been truly successful and efficient in their work, to have *accelerated* the brightest seniors or those with the best mental endowment; to have *retarded*

<sup>1</sup> See particularly the study by Mrs. L. W. Pressey, "The Measurement of Intelligence and School Attainment in the First Three Grades," a dissertation for the degree of Doctor of Philosophy, Indiana University, June, 1920. Compare also the method suggested by Rudolph Pintner, "The Mental Survey," D. Appleton and Co., New York, 1918.

those possessing the most inferior grades of intelligence ; and to have promoted *regularly* all those who possess only average mental ability. In the light of these developments we desired to determine by this investigation the extent to which the high schools of the state were adjusting themselves to the inequalities in mental strength actually found among their students. We were particularly interested in the following four problems which will be considered in detail in this chapter :

1. Are the high schools of the state accelerating as many students as our intelligence tests indicate that they should ?

2. Are they able to locate the brightest students and to make adequate provision for their proper advancement ? That is to say, are the best mentally endowed students permitted to complete their high school course as rapidly as they can and should ? Do the high schools of the state retard only such students as rank, in general intelligence, below the average for our total or standard group, and do they promote regularly only those who possess average mental ability when judged by this standard ?

3. Which is succeeding better in adapting its organization and work to the mental inequalities and interests of its pupils, the elementary school or the high school ?

4. Is the high school adapting itself in all these respects as well to the interests and needs of the boys as to those of the girls ?

To obtain data that would make it possible to answer these questions, information was secured from each student regarding his age at time of graduation, and the num-



ber of semesters he had spent in completing his four-year high school course. These statements were afterwards verified by the teacher giving the examination and in most cases by the high school principal, who provided in addition to this information the average scholastic grade made by each senior in all subjects studied during his junior year. The tabulations of the mental test scores were then made in such a way that the intelligence scores made by the students who were *accelerated* or *retarded* in high school could be compared with the scores made by the group that had been *regularly promoted* and with our state standard.

**1. Number of students accelerated, retarded, and normally advanced by the school.** The first problem was to ascertain whether there were as many pupils in the senior classes of Indiana high schools who had been accelerated, retarded, and normally advanced in school as the inequalities in intelligence revealed by this study would lead us to expect. The number accelerated or retarded during their high school course, and the number normally advanced, are shown by the number of semesters each student required to complete his high school course. Some completed a four-year course in six semesters or three years, others required ten or twelve semesters to graduate. Most seniors completed the course in normal time, or eight semesters. The exact situation with regard to the seniors who took the mental tests is shown in Table IV, which gives the per cent of our total group who were (1) accelerated, (2) retarded, and (3) regularly advanced by the high school. If they graduated in six or

seven semesters, they were judged accelerated; if they required nine or more semesters to complete a four-year course, they were judged retarded; if they graduated in eight semesters, they were considered as regularly promoted in high school.

TABLE IV

PER CENT OF SENIORS WITH ACCELERATED, RETARDED, AND NORMAL STANDING IN HIGH SCHOOL

	Boys	Girls	SEXES COMBINED	CASES
Per cent accelerated (graduating in 6 or 7 semesters) .....	5.5	6.13	5.85	338
Per cent retarded (graduating in 9 to 12 semesters).....	4.5	3.28	3.78	217
Per cent with normal standing (graduating in 8 semesters) .....	90.00	90.60	90.34	5193
Total cases .....	2306	3442	5748	5748

TABLE V

SAME RESULTS GIVEN IN TABLE IV DISTRIBUTED BY SEMESTERS

PER CENT COMPLETING THEIR HIGH SCHOOL COURSE IN:	Boys	Girls	SEXES COMBINED
6 Semesters.....	.91	1.28	1.13
7 Semesters.....	4.59	4.85	4.73
8 Semesters.....	90.00	90.60	90.34
9 Semesters.....	2.86	2.33	2.58
10 Semesters.....	1.48	.90	1.13
11, 12 Semesters.....	.17	.02	.09
Total cases.....	2306	3442	5748

Table VI shows the per cent of students who were retarded or accelerated at some time during their *entire* school course; also the proportion of seniors who had been regularly advanced. For purposes of comparison we con-

## 50 INTELLIGENCE OF HIGH SCHOOL SENIORS

sidered that a senior had normal school standing throughout the high school and grades if he had completed the work of the eight grades and four years of high school in twelve years, graduating from high school at 18. Those seniors, therefore, who graduated at 15, 16, or 17 were counted as accelerated in their total school standing from 1 to 3 years. Those graduating when they were 19, 20, 21, 22, or more years of age were counted as retarded 1 to 4 years.<sup>1</sup> Where or how the time was lost we cannot tell. The table gives the per cent of our total number who belonged to each of these groups.

TABLE VI

PER CENT OF SENIORS ACCELERATED, RETARDED, AND NORMALLY ADVANCED THROUGHOUT THEIR ENTIRE SCHOOL COURSE

	BOYS	GIRLS	SEXES COMBINED	TOTAL CASES
<i>Normal Group</i>				
Per cent completing high school at age of 18.....	39.4	40.1	39.85	2268
<i>Accelerated Group</i>				
Per cent completing high school at age of 15, 16, or 17.....	40.2	43.2	42.01	2392
<i>Retarded Group</i>				
Per cent completing high school at age of 19 to 23.....	20.3	16.6	18.14	1088
Total cases.....	2306	3442	5748	5748

<sup>1</sup>This does not, of course, take into account the fact that some of the seniors accelerated one or more years in their school standing may have been taught at home before starting to school and so gained a grade or two outside of school, or that others may have lost a year or more on account of illness. It is believed, however, that the method gives a fair measure of the amount of retardation and acceleration which occurred among the group of students tested.

TABLE VII

TOTAL PER CENT OF ACCELERATES, NORMALS, AND RETARDS DISTRIBUTED BY AGE

PER CENT COMPLETING HIGH SCHOOL AT AGE OF:	BOYS	GIRLS	SEXES COMBINED	TOTAL CASES
15	.57	.46	.51	29
16	7.20	6.93	7.04	401
17	32.38	35.81	34.45	1962
18	39.40	40.10	39.85	2268
19	16.08	13.45	14.68	836
20 to 27	4.25	2.92	3.46	252
Total cases.....	2306	3442	5748	5748

2. Number of seniors with superior, average, and inferior intelligence. The percentage of students who made superior, average, and inferior scores on the mental tests is shown in Table VIII. As said before, a mental rating of A<sup>+</sup> or A indicates *very superior*; B *superior*; C<sup>+</sup> or C and C<sup>-</sup> *high average, average, and low average*, respectively; D and E *low and inferior*; E<sup>-</sup> and F *very inferior* intelligence for high school seniors.

TABLE VIII

GRADES OF INTELLIGENCE POSSESSED BY HIGH SCHOOL SENIORS

	SUPERIOR			AVERAGE			INFERIOR			
Intelligence grades.....	A <sup>+</sup>	A	B	C <sup>+</sup>	C	C <sup>-</sup>	D	E	E <sup>-</sup>	F
Per cent of total group possessing each.....	2	6	14	22	11	19	13	7	5	1



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According to this method of ranking, 22 per cent of all seniors tested possessed very superior or superior intelligence; 52 per cent possessed average intelligence; and 26 per cent possessed inferior or very inferior grades of intelligence for high school seniors.

It therefore appears that there were fewer students retarded during their school career than were ranked D, E, or F on the mental tests. Only 20.3 per cent of the boys and 16.6 per cent of the girls were retarded, while 26 per cent ranked D, E, or F on our tests. On the other hand, there were more students accelerated one or more years in their total school standing than were ranked A or B on our tests. Of the total group giving information on this point, 42 per cent had saved one or more years during their entire school course, while only 22 per cent earned an intelligence rating of A or B on the tests. If we add to this number the students belonging to the C<sup>+</sup> group (most of the students accelerated made scores on our mental tests which gave them a C<sup>+</sup> rating), we get a percentage figure (44) which practically equals the number that were advanced by the school more rapidly than normal. That is to say, 42 per cent of our total group were accelerated at some time during their entire school course; 44 per cent made scores of A, B, or C<sup>+</sup> on the mental tests. About 40 per cent of our total group had been regularly advanced throughout their entire school course, but only 30 per cent of our total group obtained a mental rating of C or C<sup>-</sup> on the tests. If we add to this number all those rated D, we would have 43 per cent, which comes within 3 per cent of the number promoted regularly each year.

It seems, therefore, that most of the high average group (those ranked C<sup>+</sup>) have been accelerated at some time during their public school career, while all rated C and C<sup>-</sup> and practically all of those rated D have been normally advanced. We may conclude that the number of individuals who have been accelerated, retarded, and normally advanced by the *elementary* schools corresponds, at least roughly, to the number ranking as superior, average, or inferior in general intelligence.

But the figures for the *high school* are very different. Here only 5.85 per cent have been accelerated, 90.34 per cent have been normally advanced, while only 3.78 per cent have been retarded during their high school course. (See Table IV.) But 22 per cent of these same individuals made an A or B rating on the mental tests; 52 per cent were rated C<sup>+</sup>, C, or C<sup>-</sup> (high average, average, or low average); and 26 per cent made a D, E, or F (inferior) rating on the mental tests. If we assume that those who made an intelligence rating of C<sup>+</sup> and over are capable of being accelerated (most of those who were accelerated in high school made an intelligence rating of C<sup>+</sup>) and that those rated D were capable of making normal progress, we would have 44 per cent who should have completed the course in less than normal time; 43 per cent in normal or average time; and 13 per cent in more than four years. Over against this we have the actual records for senior classes which show that less than 6 per cent were actually permitted to complete their high school course in less than normal time; less than 4 per cent were retarded, while 90 per cent were kept on the course a full four years.

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That is to say, more than twice as many seniors were kept on their course a full four years as the intelligence scores indicate should be regularly promoted. About seven times as many made an intelligence rating indicating that they should be accelerated as were permitted to shorten their high school course, and less than one-third as many were actually retarded as our intelligence records indicate that there should be.

It appears, therefore, that the *high school* is not adapting itself to the inequalities in native mental endowment of its students as well as it should, nor as well as the elementary school. We must conclude either that other factors besides intelligence play an important rôle in producing school success and that these factors act more rigidly in the high school than in the elementary school; that our tests do not give us an adequate measure of the native mental endowment of these students; or that many students are working far below their *best standard* of attainment in high school and so are acquiring habits of laziness or inefficiency because their superior ability is not recognized and the work of the school adapted to their mental strength and needs. Our scale has been thoroughly tested and found reliable; hence we must look to the other two factors for an explanation of these facts.

**3. Intelligence of seniors whom the school accelerated, retarded, and regularly promoted.** Our second purpose in making these comparisons was to ascertain the grade of intelligence possessed by the seniors actually accelerated, retarded, and regularly promoted by the school. We wished to know whether our high schools are accelerating

their brightest students, holding back or failing only such pupils as are below average in intelligence, and promoting regularly those whose intelligence is average when compared with the general level of ability of our total or standard group. To collect data which would bear directly on this problem, we tabulated our results so that we might study separately those *accelerated*, *retarded*, and *normally advanced* by the school. We shall therefore attempt to determine (1) the general level of intelligence possessed by each of these groups, (2) the proportion of individuals belonging to each group who possess various grades of intelligence, and (3) the extent to which the schools actually select the brightest students for special advancement and retard or fail those with inferior mentality.

TABLE IX

PER CENT ACCELERATED, RETARDED, AND REGULARLY PROMOTED  
BY THE HIGH SCHOOL, SCORING ABOVE THE STATE MEDIAN

GROUPS COMPARED	ACCELERATED		NORMAL	RETARDED			CASES
	6	7		9	10	11, 12	
Semesters Required to Graduate							
Boys . . . . .	86	62	53	54	54	25	2306
Girls . . . . .	66	60	47	54	15	00	3442
Sexes combined	72	61	49	54	33	20	5748

PER CENT ACCELERATED, RETARDED, AND REGULARLY PROMOTED IN  
THE HIGH SCHOOL AND GRADES, SCORING ABOVE THE STATE MEDIAN

GROUPS COMPARED	ACCELERATED			NORMAL	RETARDED			CASES
	15	16	17		19	20	21-27	
Age at Graduation								
Boys . . . . .	73	74	63	51	36	29	35	2306
Girls . . . . .	81	68	55	44	33	29	31	3442
Sexes combined	78	69	59	47	34	29	33	5748



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(a) *General level of intelligence of the seniors accelerated, retarded, and regularly promoted by the school.* This is indicated by the per cent of seniors belonging to each of these groups who made scores on the intelligence tests above the median for our total or standard group. The figures are given in Table IX, which shows that the

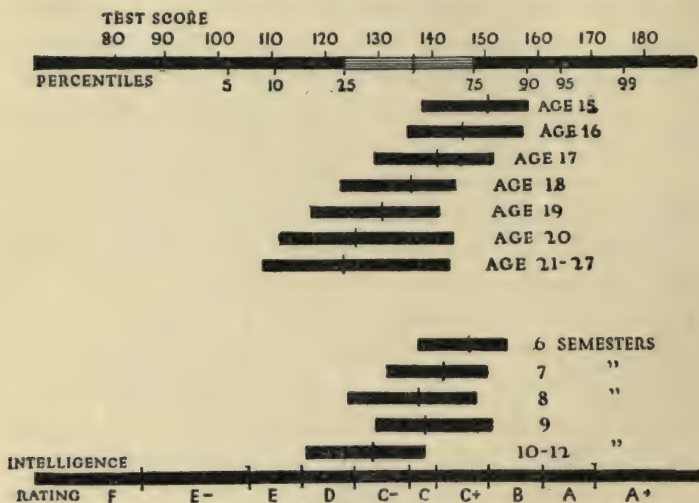


FIGURE 9. — Scores obtained by the middle 50 per cent of the seniors graduating from high school in 6, 7, 8, 9, 10, or 12 semesters, and those graduating when 15, 16, 17, 18, 19, 20, 21 to 27 years of age. Horizontal bars indicate range in score. Vertical cross-bars indicate the median score for the several age and semester groups.

students accelerated by the school, if taken as a group, rank consistently higher than those retarded or only regularly promoted.

A better idea of the general level of intelligence of these several groups may be gained from Figure 9, which

shows the record made on the mental tests by the middle 50 per cent of the seniors belonging to each semester and age group. The horizontal bars in this figure indicate the record made by the middle 50 per cent of individuals belonging to the several age and semester groups. The vertical cross-bars show the median score for each group. The figure shows very clearly how far superior in central tendency the students are who completed their high school course in 6 or 7 semesters, or graduated from high school when only 15, 16, or 17 years of age. It shows also how far below the state standard the groups fall who were retarded in their total school standing one or more years.<sup>1</sup>

It should also be pointed out that the groups accelerated by the school are superior at every level of ability to the groups retarded or only normally advanced. This is shown by the percentile curves presented in Figures 10 and 11. That is to say, the seniors belonging to the accelerated groups making scores which place them in the lower sectors of our total distribution do not fall quite so low on the tests as do the individuals belonging to the retarded group. In fact, they rank higher for every percentile level than either the normal or retarded group. And the result is the same no matter whether we compare those accelerated in the high school (the semester groups) or

<sup>1</sup> It might be stated in this connection that Mr. Rice, whose study of the correlation between intelligence rating and average school marks is described in the next chapter, found a negative correlation between intelligence and age of .38, P. E. .05. And between age and scholastic success during their four-year high school work of .47, P. E. .05. Master's Thesis, Indiana University, June, 1920.

## 58 INTELLIGENCE OF HIGH SCHOOL SENIORS

those accelerated and retarded at some time during their entire school course, the various age groups. Compare Figures 10 and 11, which are typical for all the age and semester groups.

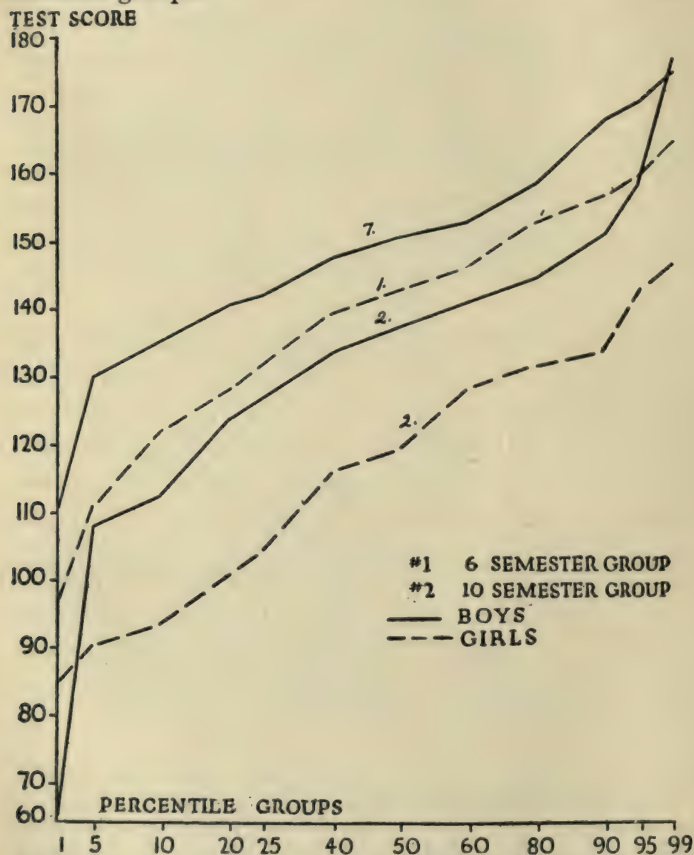


FIGURE 10. — Curves showing scores obtained by various proportionate groups of boys and girls accelerated (6-semester group) and retarded (10-semester group) one year in high school.

(b) *Grades of intelligence possessed by the seniors whom the school has accelerated, retarded, and normally advanced.* We were, however, interested not merely in determining

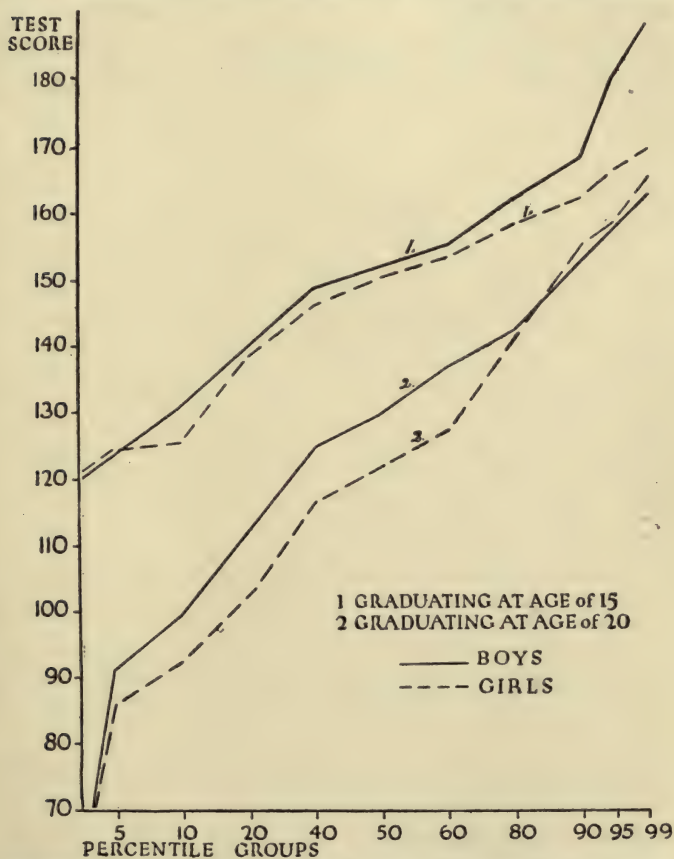


FIGURE 11. — Curves showing scores obtained by proportionate groups of boys and girls graduating at age of 15, accelerated three years, and 20, retarded two years, during their entire school course.



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the general level of intelligence of the seniors belonging to these several groups, but also in ascertaining the exact grades of intelligence which each of these groups actually possessed. This was done by calculating the percentage of seniors belonging to these several groups, who possessed each grade of intelligence from the highest

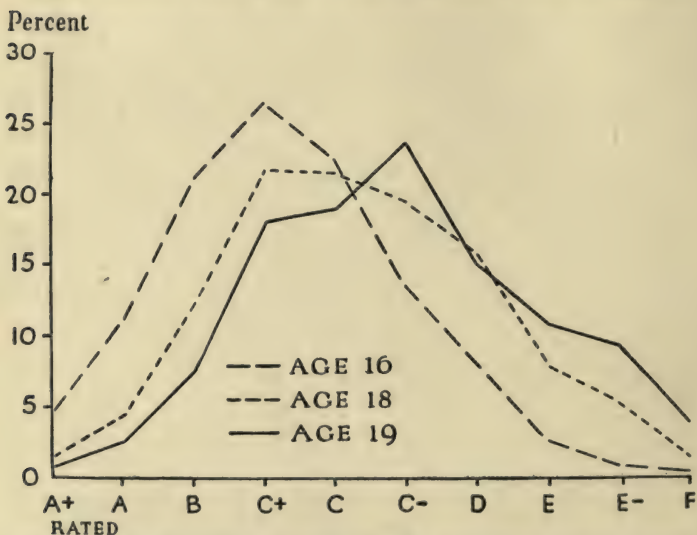


FIGURE 12. — Frequency curves for seniors graduating from high school at ages of 16, 18, and 19, showing the percentage belonging to each group who possess each grade of intelligence from the highest (A+) to the lowest (F).

to the lowest. Typical results from these comparisons are shown in Figures 12 and 13, which reveal again the superiority of the groups accelerated by the school over the groups retarded or only normally advanced. The curves for the accelerated groups rise above the curves for the

retarded and normally promoted groups at all points indicating the higher grades of intelligence and pass below them at all points indicating the lower grades of intelligence.

Figure 12 compares the seniors accelerated two years in total school standing, the 16-year-old group, with the

Percent

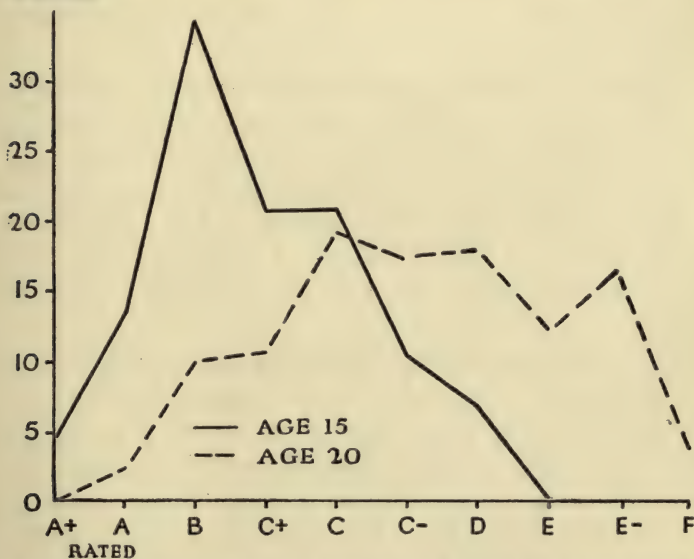


FIGURE 13. — Frequency curves for seniors graduating at ages of 15 and 20, showing the percentage belonging to each group who possess each grade of intelligence found among high school seniors.

seniors retarded one year at some time during their entire school course, the 19-year-old group, and both these groups with the group that had been normally advanced by the school. As may readily be seen from a glance at these curves, the group graduating at 16 is distinctly superior

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to both other groups in the percentage of individuals belonging to the group who possess the higher grades of ability. This curve is higher at all points representing the A<sup>+</sup>, A, B, and C<sup>+</sup> grades of intelligence and lower at all points indicating the lower grades of mental ability. The curve for the normal or average group passes about midway between the other two curves at every point but one.

Figure 13 shows the distribution of all grades of ability for the seniors graduating at the ages of 15 and 20 respectively. The striking feature of these curves is the large proportion of students graduating at 15 who possess a superior or B grade of intelligence, and the correlative fact that the largest percentage of seniors graduating at the age of 20 possess only a C<sup>-</sup>, D, or E grade of intelligence.

The data and curves for all the age and semester groups can, of course, not be given in this report. But the data for each of these groups was prepared and curves drawn for comparative study. These data show that the frequency curves for the various semester groups have the same general tendencies shown by the curves for the age groups presented in Figures 12 and 13. If we combine the results for all groups accelerated or retarded in the high school or elementary grades, we get the results shown in Figures 14 and 15 below. Figure 14 gives the record for all seniors accelerated, retarded, and regularly advanced in high school. It shows the percentage belonging to each group who possessed each grade of intelligence from the highest to the lowest. Figure 15 gives similar data for the

seniors who were accelerated, retarded, and regularly promoted during their entire school course.

We may, therefore, conclude that the seniors who have been advanced more rapidly than normal by the school, if taken as a whole, are brighter than the average of our total

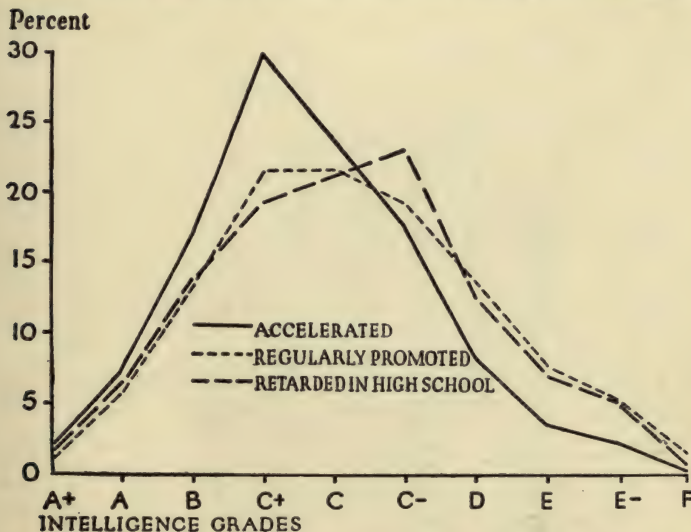


FIGURE 14. — Frequency curves showing the percentage of all seniors accelerated, retarded, and regularly promoted in the high school who possess each grade of intelligence (A+ to F) found among high school seniors.

or standard group, and that those who were retarded by the school are duller than our total or standard group. The data also show that the greater the acceleration or retardation the brighter or duller do the pupils seem to be.

*The most significant facts revealed by our comparative study of these several groups are, however, not brought*



out by the figures and tables presented thus far. We were especially interested in knowing whether the schools are succeeding in selecting their *brightest* students for special advancement, and if it is the *dullest* pupils who are being retarded by the school.

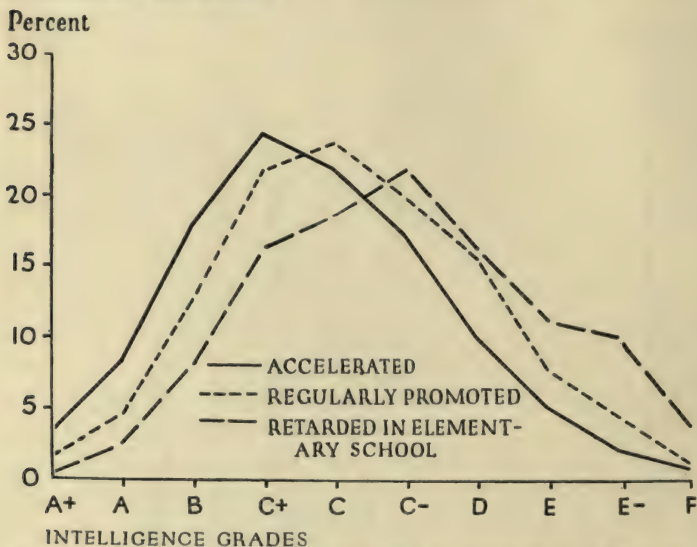


FIGURE 15. — Frequency curves showing the percentage of all seniors accelerated, retarded, and regularly promoted in the elementary school who possess each grade of intelligence found among high school seniors.

(c) *Range of intelligence of the seniors whom the school has accelerated, retarded, and regularly advanced.* If we consider the percentage of students belonging to each of these groups who possess the highest (A or B) and the lowest (D, E, or F) intelligence grades made by high school seniors, we find that the group of seniors accel-

erated by the school ranks distinctly higher than the groups that have been only normally advanced or actually retarded. This fact holds true whether we consider those

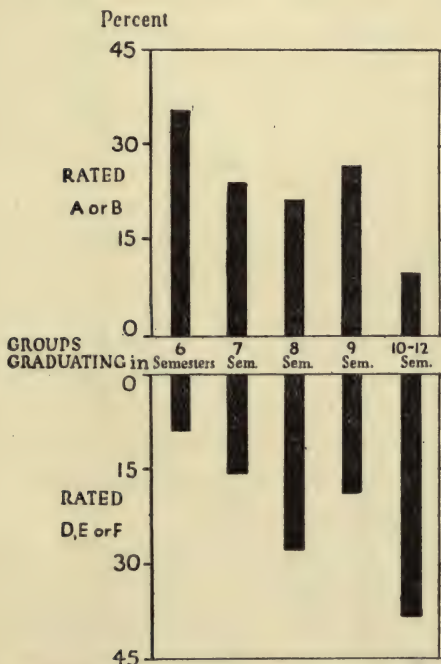


FIGURE 16. — Percentage of seniors graduating from high school in 6 to 12 semesters who possessed the highest (A or B) and the lowest (D, E, or F) grades of intelligence found among high school seniors.

who were accelerated in the high school, or those accelerated, retarded, or regularly promoted during their entire school course.

Figure 16 shows the percentage of students belonging to

the several *semester* groups who possessed the highest and lowest grades of intelligence, and as may readily be seen there is a regular gradation downwards from the group graduating in 6 *semesters* to the group requiring 10 or 12 semesters to complete a four-year high school course, indicating that the groups accelerated by the high school, if taken as a whole, not only are brighter than those retarded or regularly promoted, but the more they are accelerated the brighter do they seem to be.

Figure 17 presents the results of a similar comparison made of the several age groups and shows that the group of seniors graduating at the age of 15 has a much larger percentage of students ranking A or B on the intelligence tests, and a smaller percentage ranking D, E, or F, than are found in our total or standard group; that it is decidedly superior to the group graduating at 16, while the latter group is superior in both respects to the group graduating at the age of 17, and so on down the list to the oldest or most retarded group.

(d) *Brightest seniors are not accelerated.* If, however, we push our comparisons one step further, we get a different story. The range in score for the group normally advanced by the school extends much higher on the intelligence scale than did the scores for the students who had been accelerated. That is to say, the brightest students in last year's graduating classes are not found among the group which the school accelerated, but among the group which had been only regularly promoted. A large percentage of these brightest seniors are even found among those only normally advanced throughout their entire

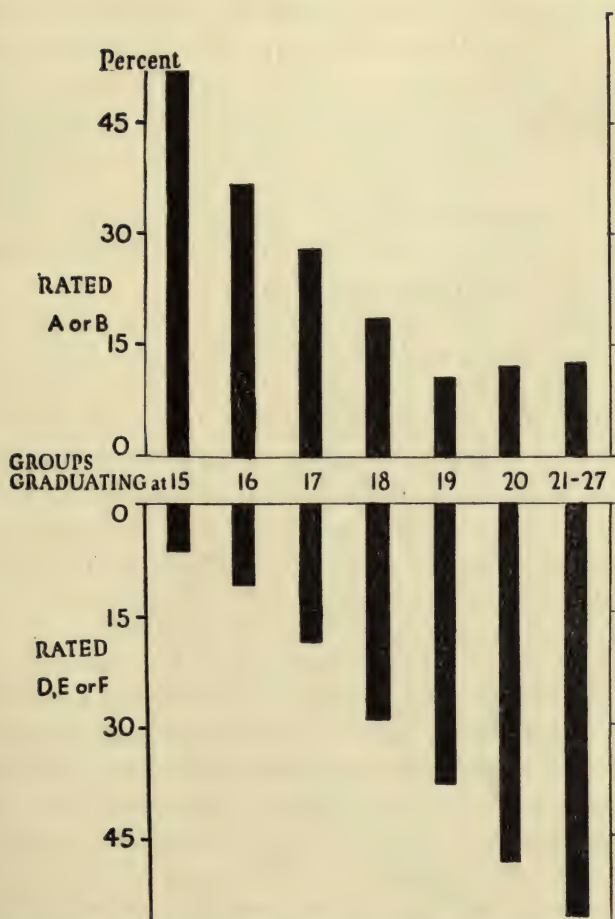


FIGURE 17. — Percentage of seniors graduating from high school at various ages (15 to 27) who possessed the highest (A or B) and the lowest (D, E, or F) grades of intelligence found among our total or standard group.



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school course. In other words, neither in the high school nor in the elementary grades were these brightest students located and advanced more rapidly than the normal rate of promotion. Our distribution tables also revealed the fact that some seniors accelerated from one to three years in their total school standing possessed only average and at times very inferior grades of intelligence. On the other hand, most of the seniors accelerated by the schools rank only C<sup>+</sup> in the intelligence tests.

Taking as an example the group of seniors who possess a very superior grade of intelligence (the A<sup>+</sup> group), we find that less than 6 per cent of this group were accelerated by the high school; 90 per cent were only normally advanced; while 3 per cent were actually retarded. On the other hand, of the total number accelerated by the school only 2 per cent possess an A<sup>+</sup> grade of intelligence; 30 per cent a high average or C<sup>+</sup> grade of intelligence; the rest received a low average or inferior intelligence rating on our tests. (Compare Figure 14, page 63.)

A similar tendency is found, though not so marked, among those accelerated, retarded, and regularly promoted in the elementary schools. And it appears that the brightest students are more consistently selected for double promotion in the elementary schools. These and other facts are presented in detail in Tables X and XI below and Figures 14 and 15, pages 63 and 64.

Table X divides our total group of seniors into three classes: (1) those accelerated by the high school, (2) the per cent normally advanced, and (3) the per cent retarded from one to four semesters. It shows the percentage pos-

sessing each grade of intelligence that belong to each of these groups.

TABLE X

PERCENTAGE OF THOSE POSSESSING EACH GRADE OF INTELLIGENCE WHO WERE ACCELERATED, RETARDED, AND REGULARLY PROMOTED IN HIGH SCHOOL

MENTAL RATINGS OR GRADES OF INTELLIGENCE	PER CENT ACCELERATED	PER CENT REGULARLY PROMOTED	PER CENT RETARDED	CASES
A <sup>+</sup>	5.83	90.83	3.34	120
A	7.14	88.69	4.16	336
B	7.28	88.94	3.76	796
C <sup>+</sup>	8.05	88.59	3.34	1254
C	6.52	89.72	3.76	613
C <sup>-</sup>	5.36	90.08	4.55	1099
D	3.68	92.75	3.55	759
E	2.92	93.43	3.65	411
E <sup>-</sup>	2.76	93.42	3.80	289
F	1.41	97.18	1.41	71
Cases	383	5193	217	5748

From a study of the table it may readily be seen that most individuals possessing superior and very superior grades of intelligence are required to spend four years on their high school course; that only a few of the ablest seniors have been accelerated, while a few possessing the most superior grades of intelligence have been actually retarded. Only about 6 and 7 per cent, respectively, of those possessing an A<sup>+</sup> or A grade of ability were advanced more rapidly than normal during their high school course; about 91 and 89 per cent were normally advanced, *i.e.* were kept in high school eight full semesters to complete their course; while 3 and 4 per cent were actually retarded one or more semesters. And what seems just as astound-

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ing and paradoxical is the fact that about 3 per cent of the pupils rated E, and  $1\frac{1}{2}$  per cent of the seniors rated F, were *accelerated* one or more semesters in high school; 93 and 97 per cent of those possessing these lowest grades of intelligence were regularly promoted; while only about 4 and  $1\frac{1}{2}$  per cent were retarded one or more semesters.<sup>1</sup> (See Table X, page 69.)

Table XI gives similar data for the seniors who were (1) accelerated, (2) retarded, and (3) normally advanced throughout their entire school course. Here we get a somewhat different story. Of the students accelerated at some time during their entire school course, 67 and 61 per cent possess an A<sup>+</sup> or A grade of intelligence. Only 5 and 8 per cent of this group of superiors were retarded at some time during their entire school career; 28 and 31 per cent were regularly promoted. A much larger percentage (29, 17, and 24 per cent) of the individuals accelerated at some time during their entire school course fall into the lowest intelligence ranks (E and F), showing that relatively more individuals with inferior intelligence are doubly promoted in the elementary grades. It is also worthy of note that there is a regular decline in the percentage belonging to the accelerated group as we pass from the highest to the lowest grades of mental ability, and conversely for the retarded group, showing that the elementary school is in general promoting the brighter students. (See Table XI.)

<sup>1</sup> It may be argued that all those who are admitted to advanced standing are capable mentally of being regularly promoted. If this be the case, what shall we say about the most superior seniors in the state who are only regularly promoted?

TABLE XI

PER CENT OF THOSE POSSESSING EACH GRADE OF INTELLIGENCE WHO HAVE BEEN ACCELERATED, RETARDED, AND REGULARLY PROMOTED IN BOTH THE HIGH SCHOOL AND ELEMENTARY SCHOOL

GRADES OF INTELLIGENCE	PER CENT ACCELERATED	PER CENT REGULARLY PROMOTED	PER CENT RETARDED	TOTAL CASES
A <sup>+</sup>	66.67	28.45	4.87	120
A	60.91	30.61	8.48	336
B	53.70	35.30	11.00	796
C <sup>+</sup>	46.46	39.28	14.26	1254
C	42.95	40.36	16.67	613
C <sup>-</sup>	37.69	40.71	21.59	1099
D	30.90	46.03	22.95	759
E	29.23	41.79	29.00	411
E <sup>-</sup>	17.24	41.72	41.03	289
F	24.26	26.09	49.28	71
Cases	2392	2268	1088	5748

From the facts already presented in Figures 14 and 15 above, it may be seen that aside from the facts just presented there is little difference in the type of student which the schools elect for acceleration. In both the high and elementary schools more students possessing a B or C grade of intelligence are accelerated than belong to any other intelligence rank. The elementary school seems to accelerate a few more students rated A than does the high school. But it also seems to retard more students possessing superior intelligence than does the high school. With these exceptions the tables show the same general tendencies, which may be briefly summarized as follows:

1. Individuals of all grades of ability from the highest



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to the lowest are accelerated, retarded, and normally promoted by both the high and elementary school.

2. A larger percentage of individuals belonging to the higher grades of intelligence are accelerated by both than are retarded, and conversely, most individuals retarded possess a low average or inferior grade of intelligence.

3. But a large majority of the seniors accelerated possess only average or high average intelligence.

4. The brightest seniors are not selected for acceleration.

5. All these facts hold, though in varying degrees, for both the high school and elementary school.

**4. Sex differences.** Three of the four questions raised by the data presented in this chapter have now been answered. The schools, particularly the high schools, are not accelerating as many of their students as the intelligence tests indicate that they should. They are promoting only regularly many students who should be accelerated, if our mental test scores may be taken as a criterion of the success that should be attained in school. Moreover, the brightest seniors were never accelerated and the high school is not adapting itself as well to the inequalities in the mental strength of its pupils as is the elementary school. Our fourth question, whether the high school is adapting itself as well to the mental capacities and interests of the boys as to the girls, is answered by the facts revealed by our comparative study of the intelligence scores of the boys and girls who were actually accelerated, retarded, and regularly promoted by the school.

As was shown in Chapters II and III the boys who took our mental tests made consistently higher scores than did the girls. They showed every indication of possessing grades of mental ability superior to that possessed by the girls who took our mental tests. We would therefore expect them to have been more rapidly advanced by the school than were the senior girls.

Figure 18 compares the boys and girls belonging to the various semester groups on the basis of central tendency

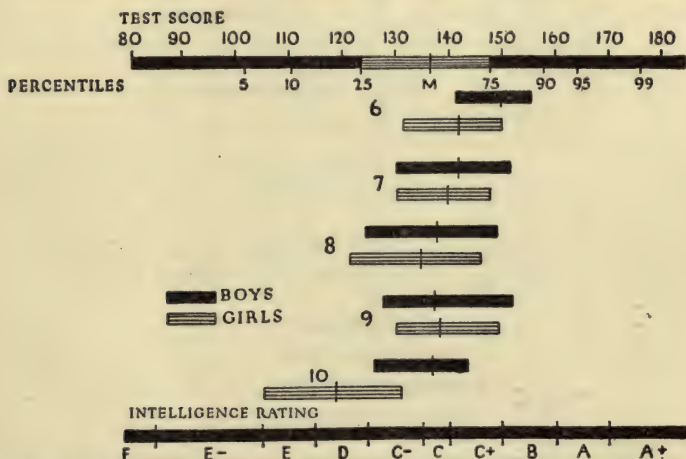


FIGURE 18. — Scores obtained by middle 50 per cent of the boys and girls belonging to the several semester groups (6, 7, 8, 9, and 10). Horizontal bars show range in score. Vertical cross-bars indicate median scores for each group.

and shows how much brighter are the boys who have been accelerated and retarded a year in high school than the girls belonging to similar groups. This is not so marked for the age groups, as may be seen by consulting

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Figure 19, which shows that the boys and girls who have been accelerated or retarded three years during their entire school course are much more nearly equal in intelligence than are the 6- and 10-semester groups.

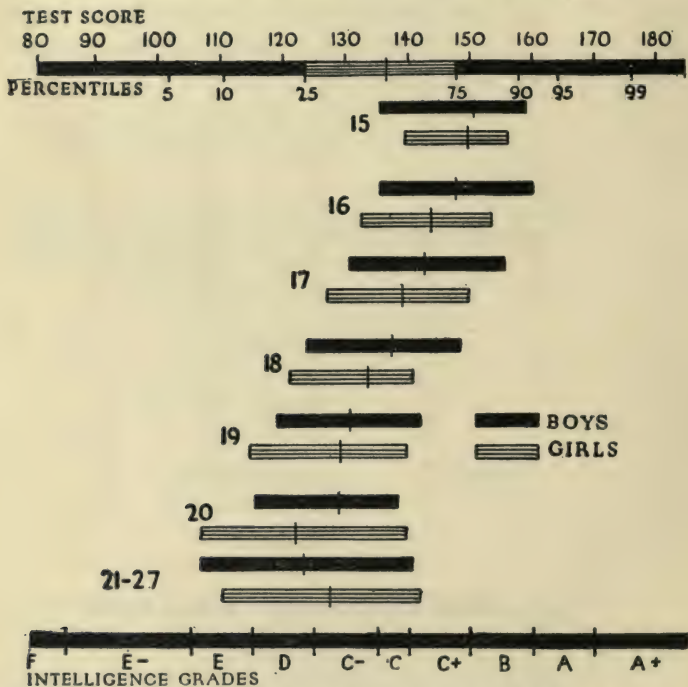


FIGURE 19. — Scores obtained by middle 50 per cent of boys and girls, graduating at different ages (15, 16, 17, to 27). Horizontal bars show range in score. Vertical cross-bars indicate median score for each age group.

The same point is brought out if we compare the students accelerated in high school and those accelerated in the elementary school on the basis of the range of intelli-

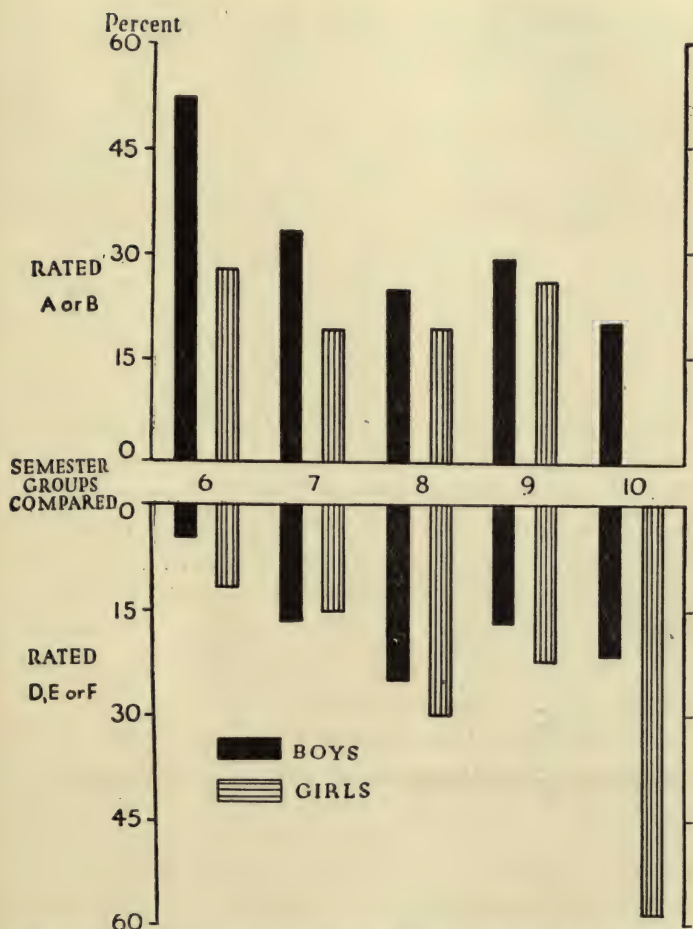


FIGURE 20.—Percentage of boys and girls graduating in 6, 7, 8, 9, or 10 semesters who possess the highest (A or B) and the lowest (D, E, or F) grades of intelligence.



gence possessed by these several groups. Figure 20 compares the boys and girls graduating from high school in 6, 7, 8, 9, and 10 semesters, on the basis of the percentage belonging to each group who possess the highest, or A and B grades of intelligence, and the lowest, or D, E, and F grades. It shows that a much larger percentage of the boys accelerated in high school are rated A or B (53 and 33 per cent respectively) than girls (27 and 19 per cent respectively). This difference in favor of the boys is out of all proportion to the slight superiority in mental ability that has been shown by them throughout the study.

The same superiority of the boys appears if we compare the per cent of boys and girls making scores above the state median. This was 86 and 62 per cent respectively for the boys graduating in 6 and 7 semesters, and only 66 and 60 per cent for the girls. The reason that the difference is less for the 7-semester group is obviously due to the fact that in this comparison were included all those who made a ranking of C<sup>+</sup> on the tests, the grade of intelligence possessed by most of the girls accelerated by the school.

The same point is brought out in a negative way if we examine the record made on the tests by the boys and girls who were retarded in high school. Of the group of boys kept in high school 10 or more semesters to complete their four-year course, 20.58 per cent made an intelligence rating of A or B. Among the girls requiring an equal amount of time to complete their high school course none made a score on the mental tests which entitled them to an A or B intelligence rating, but 58 per cent of this same group of girls

merited an intelligence rating of D, E, or F, as contrasted with only 20 per cent for the boys. (Compare Figure 18.)

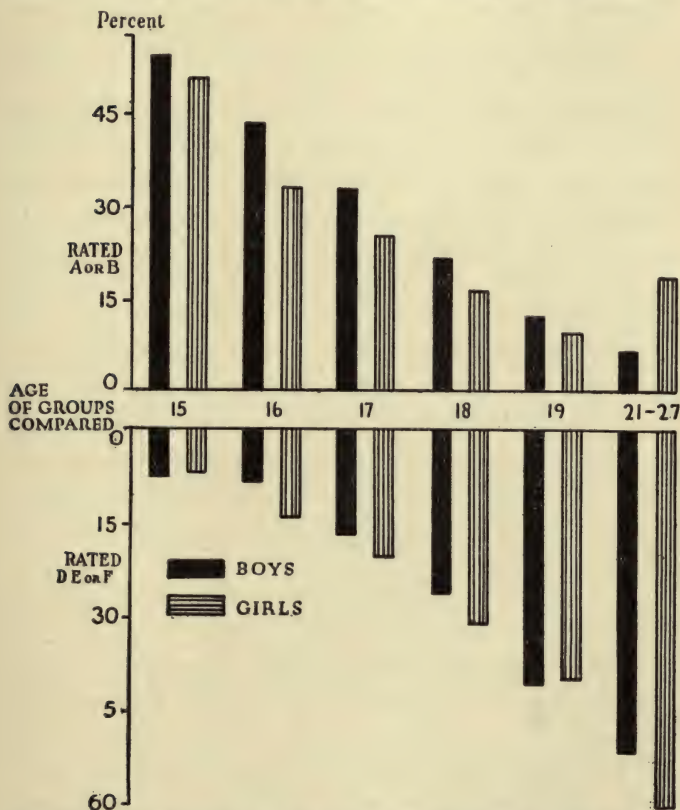


FIGURE 21. — Percentage of boys and girls graduating at age of 15 to 27 who possess the highest (A or B) and lowest (D, E, or F) grades of intelligence.

If we compare, on this basis, the boys and girls who have been accelerated or retarded as much as three years during

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their entire school course, namely, those graduating at the age of 15 and 20, or 21-27, we find little difference between the percentage of boys and girls that made the highest, A or B, and the lowest, D, E, or F, intelligence rating. (See Figure 21, page 77.)

Frequency curves, showing the percentage of boys and girls belonging to the several age and semester groups who possess each grade of ability from A<sup>+</sup> to F, reveal the fact that the girls who required 10 or more semesters to graduate from high school are decidedly inferior in mental ability to the boys retarded an equal time in their high school work. For example, none of the girls requiring 10 semesters to graduate made a mental rating above C<sup>-</sup>. The entire group made scores which gave them a C<sup>-</sup>, D, E, or F intelligence rating. The case is quite different for the boys. The boys who spent 10 or more semesters in high school made scores on our mental tests which placed them at every level of mental ability. In other words if a girl is retarded in high school, we may conclude, on the basis of our results, that she possesses inferior mental ability. This is not the case for the boys. Many boys who have been retarded possess superior grades of ability. (Compare also the 10-semester groups in Figure 18 already referred to.)

If we compare the various age groups, we get a different result. For example, we have about the same percentage of boys as girls graduating at the ages of 15 (three years accelerated) and 19 (one year retarded) who made scores giving them an intelligence rating of A or B. This would seem to indicate that the high school work is not so well

adapted to the interests and needs of the boys as to the girls.

If further evidence were needed to establish this point, it may be found in the fact that the girls accelerated in their high school course made a much lower rating on the mental tests than did the boys who were thus accelerated. Of the girls graduating in six semesters 11.37 per cent made an intelligence rating of D, E, or F, while only 4.76 per cent of the boys in the corresponding group were rated as low. (See Figure 18 above.) But notwithstanding these facts more girls than boys were accelerated by the school. Some other reason besides native mental endowment must be found to account for the fact that the girls were more rapidly advanced by the school than the boys.

That the cause for this ill adjustment lies in the high school rather than in the elementary school is shown by the fact that the same general tendencies described above for the high school or semester groups are found in the age groups, but to a smaller degree. The boys in the various age groups are still superior to the girls, both in intelligence (compare age groups in Figures 18 and 19) and in the frequency with which they are found among the groups possessing the higher grades of ability. (Compare Figures 20 and 21 and the frequency curves in Figures 22 and 23.) But when we compare the several age and semester groups in both these respects we find that the differences in favor of the boys are much greater for the semester groups (those accelerated and retarded by the high school) than for those who are accelerated and retarded by the elemen-



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tary school. In the elementary schools the girls are brighter than the boys;<sup>1</sup> hence we would naturally expect

Percent

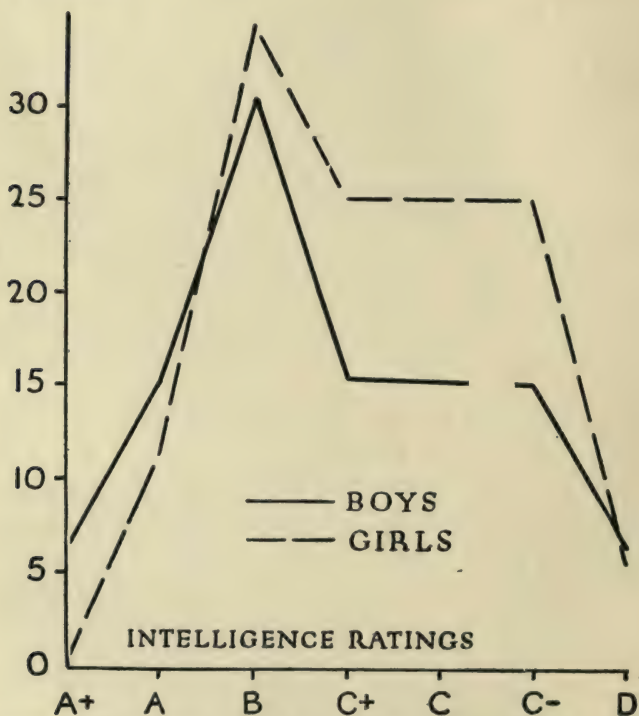


FIGURE 22. — Frequency curves showing percentage of boys and girls graduating at age of 15 who possess each grade of intelligence (A<sup>+</sup> to F) found among high school seniors.

<sup>1</sup> See study made by Mrs. L. W. Pressey, using these same tests on children in the elementary school grades. Published in the *Journal of Applied Psychology*, December, 1918, Vol. II, pp. 323-340. In this study the girls made consistently higher scores on the intelligence tests than did the boys.

the differences between the boys and girls belonging to the age groups to be less than they are in the high school where the boys are distinctly brighter than the girls. But notwithstanding the fact that the senior boys tested in

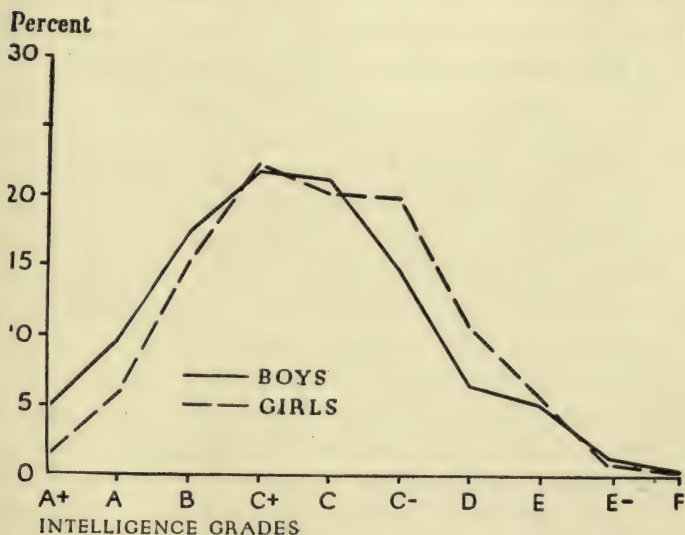


FIGURE 23.—Frequency curves showing percentage of the boys and girls graduating at age of 17 who possessed each grade of intelligence found among high school seniors.

this study are distinctly brighter than the girls, the latter have been advanced more rapidly by the high schools.

From the records covering the entire 12-year period that our seniors were in school, we find that 43 per cent of the girls were accelerated by the school while 40 per cent of the boys were accelerated. We also find more boys retarded, 20.3 per cent of the boys as against 16.6 per cent of the

girls. This is what we should expect, since the girls in the elementary schools make higher intelligence scores than the boys and since the boys accelerated and retarded by the elementary schools show less superiority over the girls than those accelerated and retarded in the high school. In the high school the situation is just the reverse. We still have a larger percentage of girls accelerated than boys (6.13 per cent of girls and only 5.5 per cent of the boys) and a larger per cent of the boys retarded. But here the boys make distinctly and consistently higher scores on the intelligence tests than the girls. It would, therefore, appear that the high school is adapting itself better to the interests and needs of the girls than the boys, and is not adapting itself as well to the inequalities in mental strength of either sex as is the elementary school.

We must conclude either that the high school work is better adapted to the interests and needs of the girls, that the girls are more conscientious and persistent about their high school work, and therefore more successful, or that our tests are better adapted to the boys. That the latter is not the case has been shown by the results obtained by giving the same tests to many thousands of school children in several states. In the grades below the high school the girls have been consistent in making scores on the same mental tests which are distinctly higher than the scores made by the boys for every school grade and every age up to 14.<sup>1</sup>

<sup>1</sup> Compare study by Mrs. L. W. Pressey, "Sex Differences Shown by 2544 School Children on a Group Scale of Intelligence, with Special Reference to Variability," *Journal of Applied Psychology*, December, 1918, Vol. II, pp. 323-340.

We are not interested here in the probable cause of the sex differences in the elementary grades or in the high school, but in the fact that senior boys in high school rank consistently higher in intelligence than the girls, while the girls, notwithstanding this fact, have been advanced more consistently and rapidly by the high school than the boys.

**5. General summary of facts.** Summarizing the more important facts revealed by the entire chapter, we may note the following:

1. The elementary school is doubly promoting about as many individuals as our study would lead us to expect. Forty per cent of the boys and 43 per cent of the girls taking our tests have been advanced by the school more rapidly than normal. Twenty per cent of the boys and 17 per cent of the girls have been retarded; 40 per cent have been regularly promoted. Of these same seniors 44 per cent made a superior rating on our tests; 43 per cent made an average rating; 13 per cent made an inferior rating. This is about what we should expect from the inequalities in mental strength which our tests have revealed. Whether or not the elementary schools are promoting these students as *rapidly* as their mental ability warrants, we cannot tell.

2. The *high school*, on the other hand, is accelerating fewer students than our study indicates that it should. Only 5.5 per cent of the boys and 6.13 per cent of the girls were accelerated at any time during their high school course; 90 and 91 per cent respectively were regularly promoted; 4.5 per cent of the boys and 3.28 per cent of the girls were retarded. Of these same individuals 22 per



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cent made scores on our tests which entitled them to an intelligence rating of A or B, indicating a *superior* grade of native mental endowment; 52 per cent made an intelligence rating of C, indicating *average* intelligence for high school seniors; 26 per cent made an intelligence rating of D, E, or F, indicating an *inferior* grade of intelligence.

3. That the school is succeeding to a considerable extent in adapting its work to the inequalities in mental strength found among its pupils is shown by the fact that the seniors who were advanced more rapidly than normal, in either the high school or elementary grades ranked, when taken as a group, consistently higher on the mental tests than did the seniors who were retarded or only normally advanced. It is also true that the greater the acceleration or retardation the brighter or duller does the group seem to be.

4. In this respect the high school is, however, not succeeding as well as the elementary school. In the elementary school 42 per cent of our total group were accelerated from one to three years at some time during their entire school course; 44 per cent made a superior and high average intelligence rating on the mental tests. In the high school only 5.85 per cent of our total group of seniors finished their high school course in less than normal time, while about 91 per cent were regularly promoted and 4 per cent retarded.

5. The brightest seniors in our total list were never selected for acceleration, either by the high school or in the elementary grades. Seniors with high average or slightly superior intelligence were advanced more rapidly than

normal, in largest numbers. None of the seniors who made an intelligence rating which placed them in the highest one percentile group were found in any of the accelerated groups. The most gifted individuals had either not been located by the school or if discovered were not permitted to complete their course in less than normal time. Most of the students accelerated made intelligence scores which gave them a mental rating of C<sup>+</sup> or B.

6. Most individuals possessing superior or very superior intelligence have been only regularly promoted by the high school. Only a few have been accelerated, while some of these superior individuals have been actually retarded. Of the seniors who possessed an A<sup>+</sup> or A grade of ability only 6 and 7 per cent respectively were advanced more rapidly than normal in the high school; 91 and 90 per cent of this same group were only normally advanced, while 3 and 4 per cent of these superior students were actually retarded one or more semesters while completing their high school course.

7. Most high school seniors possessing inferior grades of intelligence (93 to 97 per cent) have been regularly promoted in high school, while a few belonging to this inferior group (2 to 3 per cent) have been actually accelerated.

8. The high school seems also better adjusted to the interests and needs of the girls. The boys taken as a whole ranked decidedly higher on the intelligence tests than did the girls, but notwithstanding this fact, the girls have been more rapidly promoted in high school than the boys, and more boys than girls have been retarded. The boys

accelerated by the school made a decidedly and consistently higher rating on the mental tests than did the girls who were accelerated. Twice as many boys accelerated in high school made an intelligence rating of A or B as did the girls who were advanced more rapidly than normal. Many girls, on the other hand, with an inferior intelligence rating were accelerated. Of the girls graduating in three years 11.36 per cent made a D, E, or F rating on the tests. The boys retarded by the high school are much brighter than the girls who failed of promotion. Many boys with superior ability (21 per cent) were found in the group retarded from one to three years. No girls with superior ability or even with high average ability were found in the retarded group. If a girl is retarded in high school, we may, on the basis of our test results, assume that she possesses inferior intelligence. In fact, 58 per cent of the girls retarded in high school made an intelligence rating of only D, E, or F.

9. That the ill adjustment is greater in the high school than in the elementary school is shown by the fact that in the elementary grades only a few more girls than boys are accelerated and a few more boys than girls retarded. Here the girls are consistent in making higher grades on the mental tests. But in the high school the situation is reversed. We still have more girls than boys accelerated, and more boys retarded, but here the boys who remain to graduate make distinctly higher records on the intelligence tests than do the girls.

6. Discussion and interpretation of results. The above comparisons of the intelligence ratings of the

students accelerated, retarded, and normally promoted by the school show clearly that the high schools of the state are not adapting themselves to the inequalities in native mental strength of their students as well as they should; that they are accelerating too few students; that the teachers and school officials do not select the most intelligent students for such special advancement; that the brightest students in the state are not being selected either by the high school or in the grades for acceleration; and lastly that those selected for special advancement possess only a high average grade of intelligence. Summarizing the results of all tables and figures in this chapter, we find that more than twice as many of our seniors were kept on their course four years as possessed an average grade of intelligence for high school seniors. About seven times as many possessed a very superior grade of intelligence as were permitted to shorten their course. And less than one-third of the group possessing very inferior grades of general intelligence were actually retarded by the high school.

We must conclude either that the high schools are not adapting themselves adequately to the inequalities in mental strength found among their students, or that other factors besides intelligence play an important rôle in producing school success and that these factors act more rigidly in the high school than in the elementary school. On the face of our results it appears that many students in high schools are working far below their best standard of attainment, and so are acquiring habits of laziness and inefficiency because their work is ill adapted to their



mental strength and needs. We need to determine more accurately than has ever been done the causes for success and failure in school — to determine why the brighter students are not selected by the school for special advancement and why students who are known to be superior in native mental endowment are not advanced more rapidly during their high school career. It seems to be a habit of high school officials to keep their students in high school for four years regardless of their ability to do the work, suggesting that in many cases habits of working far below the best level of attainment are being formed by these superior students, which will serve as a permanent handicap.

The writer has in mind the case of a mathematical genius who was kept in high school four long years when he clearly could have completed the work in  $2\frac{1}{2}$  or 3 years' time without injury to his health, and doubtless with psychological profit to himself. He made high grades in every study. No problem in mathematics could be found by his teacher that he could not solve almost at sight. He had to work on his assignments so little that he was idle most of the time. That this enforced idleness did not ruin the boy cannot be placed to the credit of the school. He was merely content to busy himself with his own interests and with mathematical musings during his leisure time. In due time he graduated from high school and entered a university, where he finished in two years all the courses in mathematics offered. He graduated in less than three years, and in his post graduate work this record was maintained. It appears that his genius and special interest in mathematics saved him from falling a

prey to slovenly habits of work and kept him from losing his native interest for mathematics and school. It also kept him from developing habits of mental laziness, which might have been acquired. We can only speculate in regard to how much time was actually lost to the boy and the injury that is done to most bright boys and girls by the situation in our high schools revealed by the facts presented above.

In order to speed up the necessary military training in the army and to conserve to the fullest extent all grades of mental ability and skill possessed by enlisted men, the divisions of the army were organized, so far as possible, on the basis of equal mental strength. In this manner it was demonstrated that the necessary military training could be greatly speeded up. This was particularly the case in the officer's training camps where those with superior grades of intelligence were separately grouped and their tasks and training adjusted to their capacity to learn. How far the high schools fall short of such an organization, calculated to conserve the talents of individuals with all grades of native mental ability by adjusting their work to their interests and native mental strength, is clearly indicated by the facts presented in this chapter. We should learn to evaluate school achievement and to measure progress in learning in terms of mental capacity; that is to say, learn to apply in education the parable of the talents. In no other way can the capacities and native powers of our students be fully conserved and the work of the school made truly economical and efficient. Methods should be speedily devised whereby the school could be

organized and the work carried on in accordance with this principle.

That the maladjustment is greater in the high school than in the grades is important, because the high school has presumably conserved the most superior youths. Those with the most mediocre and inferior grades of intelligence presumably have been dropping out of school all along the way, until only the ablest remain. The special variety of talents in this highly selected group should be carefully cultivated and zealously conserved. The situation cannot be met or the poor adjustment explained away by saying that the brighter students in high school are given an opportunity to do extra work in the various subjects studied. *The situation calls for special and different treatment.* Any and all special mental capacities and talents possessed by this select group of individuals should be discovered at the earliest possible date and such adaptations made by the school as will conserve them fully to the state. If necessary, the high school organization and course of study should be entirely reorganized so that these students might be educated more in accordance with their capacities and interests. Arrangements should at least be made whereby each student could advance as rapidly as is possible for him, and special provision should be made for taking care of that small group of individuals who possess very superior mental ability or talents.

There is much evidence in this and the following chapters to show that the most superior individuals are not being properly served by the schools. This has probably always been the case and helps to explain why so many

people who fail in school make such a marked success in life in every occupation. The least we could do, therefore, would be to determine the real causes for failure and success in school, especially the causes for the failure of those known to be specially gifted in native mental endowment and the unexpected success of those possessing only average mental ability. The real causes for the failure and success of students in school should be systematically investigated and the grades of intelligence possessed by all students determined so that they might be grouped for purposes of instruction on the basis of mental strength.

Perhaps the most startling group of facts revealed by the above comparisons is that the organization and work of the high school seems better adapted to the interests and needs of the girls than the boys. The reason why the girls are more rapidly promoted than the boys when the boys are superior to the girls in general intelligence needs explanation. We might infer that the girls possess mental characteristics other than general intelligence important for school success, characteristics not possessed by the boys. If true, it is important to determine what these characteristics are, and why they seem to work better in the high school than in the elementary grades. What is more likely is that the high school and its work is not so well adapted to the interests and needs of the boys as to the girls. The nature of the work itself may be poorly adapted to the boys. It may be due in part to the fact that there are too few men teachers in the high schools. The problem should be investigated so we may know why



the superior boys are so often doing an inferior grade of school work.

We also need more accurate methods for measuring school attainment or, still better, for measuring the rate and amount of improvement that is made in every kind of learning. These measurements of success in learning or in school accomplishment should be properly coördinated with the results obtained from a study of the native mental endowment of pupils. Progress in learning should, in fact, always be evaluated in relation to the native mental ability of the learner. The progress which an individual can and is expected to make is intimately related to his native mental endowment or ability to learn. The problem of measuring the results of teaching cannot be solved pedagogically unless worked out in connection with a practical and reliable scheme of mental measurements.

Investigations along all these lines will be required before the problem of adjusting the organization and work of the school to the interests and needs of individual students can be fully and properly solved.

## CHAPTER VI

### INTELLIGENCE OF SENIORS MAKING EXCELLENT, AVERAGE, AND POOR SCHOLASTIC RECORDS IN THEIR HIGH SCHOOL WORK

IN the preceding chapter the intelligence of the high school seniors who had been accelerated, retarded, or normally promoted by the school was determined and compared with the state standard. It was found that those who had been accelerated in high school or at some time during their entire school course ranked decidedly higher on the mental tests than did those who were retarded or only normally promoted, but that the brightest high school seniors in the state had not been accelerated; that those doubly promoted by the school possessed, as a rule, only a high average grade of intelligence, that some students with very superior grades of intelligence were retarded; that others with inferior intelligence were accelerated; and that practically all belonging to the highest intelligence rank for high school seniors had been only regularly promoted in high school, along with those who possessed the lowest grades of intelligence.

It has been generally assumed that students possessing a superior or very superior grade of intelligence can and will do a superior grade of school work. On this theory intelligence tests have recently been used by certain uni-

versities in place of the usual college entrance examinations, and candidates are being selected for university scholarships on the basis of the records they make on intelligence tests. Pupils in the public schools have also been doubly promoted by progressive teachers and superintendents merely on the basis of the strength shown in intelligence tests. In most of these cases such students have been successful in their academic work. But the results cited in the preceding chapter and other data recently gathered by our own laboratory indicate pretty clearly that other mental characteristics besides intelligence are important factors in determining school success. On the basis of the facts presented in the preceding chapter we must conclude either that teachers and school officials are failing in their work, that our measures of intelligence and of school attainment are very inaccurate, or that other mental characteristics besides intelligence are important factors in determining the success or failure of students in school.

Data gathered recently in our own laboratory<sup>1</sup> show that we have no right to expect a student to do a very superior type of school or college work merely because he possesses a high degree of native mental endowment. He must possess additional characteristics, such as persistence, a proper attitude towards his teacher and the school, endurance, health, and the like, to be successful with his school work. All the factors which contribute to a pupil's success or failure in school are not known. When determined,

<sup>1</sup> S. L. Pressey, "An Attempt to Measure the Comparative Importance of Intelligence and of Certain Characteristic Traits in Contributing to Success in School," *School Review*, September, 1920.

they will probably show that general intelligence is insufficient to guarantee an individual's school success.

Because of the importance of this problem and the rather widespread notion that students who have superior native mental endowment should by virtue of this fact stand high in all their school work, we desired to ascertain in this study the relation which actually existed between the intelligence of the seniors we tested and their academic achievement.

Following the comparative method of studying various groups of high school seniors used throughout this investigation, we undertook (1) to determine the general level of intelligence of the seniors who had made an *excellent*, *average*, and *poor* scholastic record in high school; (2) to determine the range of intelligence possessed by these various scholastic groups and to ascertain whether the brighter students made the best scholastic records and the duller students the poorest school grades, etc.; (3) to determine the various grades of intelligence possessed by these various scholastic groups and their relative frequency within each group; and (4) to ascertain the actual coefficient of correlation between the intelligence scores made by all high school seniors and the average scholastic grades obtained in all high school subjects studied during the junior year.

The data for these inquiries came from the reports of teachers and principals covering the average scholarship grades obtained by each senior in all high school subjects studied during his junior year. The junior year was selected because it was thought to be fairly representative



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of the student's scholastic record in high school. His average grade in all subjects studied was taken because it was regarded as the most expressive single measure of each student's school success.

In order to divide our total group into subgroups representing various grades of academic achievement we grouped them as follows: (1) "excellent" with academic averages ranging from 95 to 100 per cent; (2) "high or very good" making grades from 90 to 94 per cent; (3) "good" from 85 to 89 per cent; (4) "medium" from 80 to 84 per cent; (5) "fair" from 75 to 79 per cent; (6) "poor" from 60 to 74 per cent. In all our computations the two middle groups, rated "good" and "medium" will be considered as the average scholastic group.

**1. General level of intelligence of the seniors making excellent average and poor scholastic records in high school.** The general level of intelligence of those making different scholastic records in high school is indicated by the per cent of seniors belonging to each scholastic group who made scores on the intelligence tests above the median for our standard or total group. These results are shown in Table XII below.

TABLE XII

PER CENT BELONGING TO DIFFERENT SCHOLASTIC GROUPS MAKING INTELLIGENCE SCORES ABOVE THE STATE MEDIAN

RECORD FOR	EXCEL- LENT, 95-100	HIGH, 90-94	GOOD, 85-89	MED- IUM, 80-84	FAIR, 75-79	POOR, 60-74	CASES
Boys . . . . .	75	67	54	47	40	22	2306
Girls . . . . .	73	58	45	39	28	23	3442

A better indication of the general level of intelligence of the seniors making these various scholastic ratings is shown in Figure 24. The horizontal bars show the intelligence scores made by the middle 50 per cent of seniors rated excellent, high, good, medium, fair, and poor in

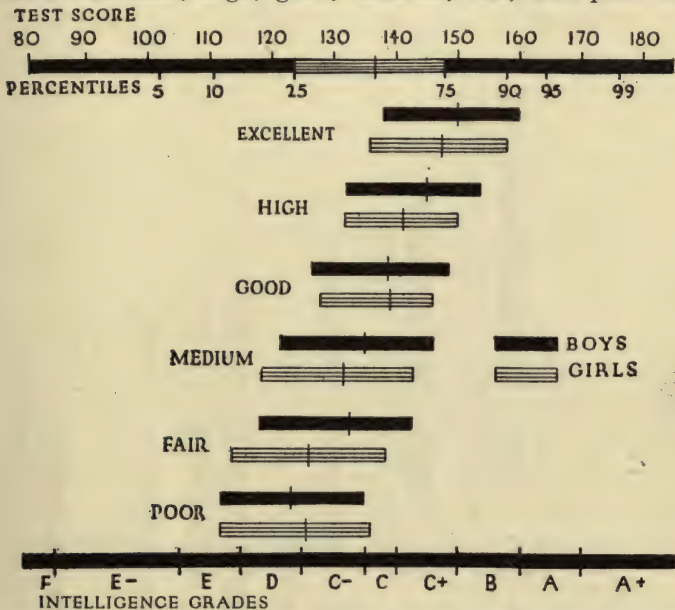


FIGURE 24. — Scores obtained by middle 50 per cent of boys and girls making a scholastic record of excellent, good, or poor on their high school work. Horizontal bars indicate record made by each scholastic group. Vertical cross-bars show median score for each group.

academic achievement. The vertical cross-bars indicate the median intelligence score for each group. The record for each scholastic group may be readily compared with the state standard or any other scholastic group.

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As may easily be seen, there is a regular and rapid decline in intelligence as we pass from the "excellent" group to the "poorest," showing that the grade of intelligence possessed by an individual is an important factor in determining his school success.

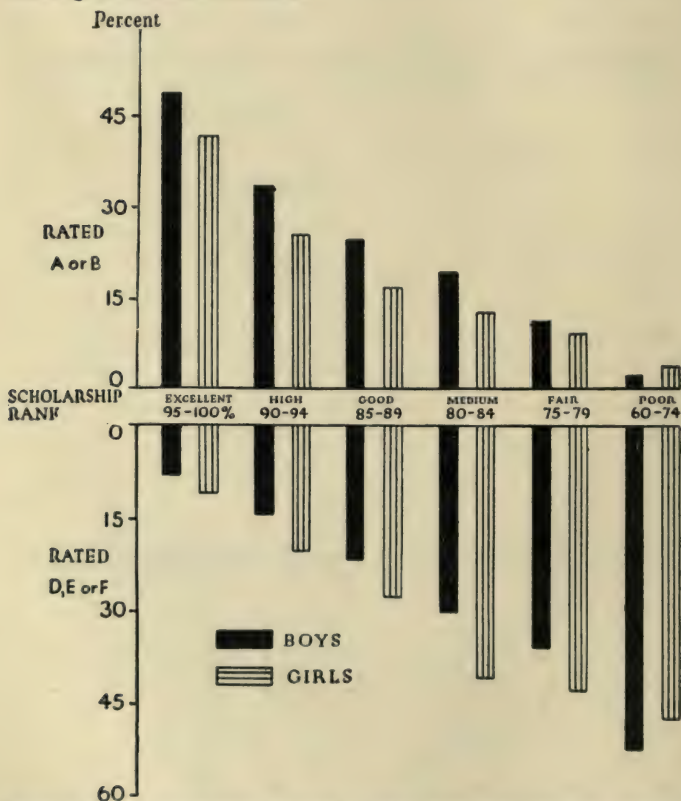


FIGURE 25. — Percentage of seniors making various scholastic records in high school, who possess the highest (A or B) and the lowest grades of intelligence found among high school seniors.

2. Range in intelligence shown by the seniors rated excellent, average, and poor in their high school work. If we ask which of these scholastic groups contains the largest percentage of seniors possessing the highest and lowest grades of intelligence, we find that the groups making the highest scholastic rating also contain the largest percentage of seniors making the best scores on our intelligence tests. Figure 25 shows the percentage of those belonging to each scholastic group who made an A or B rating on our intelligence tests; also the proportion belonging to each group possessing the lowest grades of intelligence (D, E, or F) found among high school seniors. It will be seen that the group rated "excellent," *i.e.* those making scholastic grades ranging from 95 to 100, contains the largest percentage of students possessing an A or B grade of intelligence; that the group rated "poor" contains the smallest percentage of individuals possessing these higher intelligence grades; and that there is a regular and rapid decline in the percentage of individuals belonging to these several scholastic groups as we pass from the group making the highest scholastic record to the group making the poorest record in their high school work.

If we inquire further which scholastic groups contain the brightest and dullest seniors, we obtain a similar result. The brightest students, if taken as a group, are found among those ranking "excellent" and "high" in their school work. The dullest seniors are found among those receiving the poorest grades on their school work. This is clearly shown by Table XIII.

A careful study of the distribution tables for these vari-



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TABLE XIII

PER CENT OF SENIORS OBTAINING DIFFERENT SCHOLASTIC RATINGS WHO POSSESS THE HIGHEST AND THE LOWEST GRADES OF INTELLIGENCE

INTELLIGENCE GRADE	SCHOLASTIC RATINGS					
	Excellent	High	Good	Medium	Fair	Poor
<i>Boys</i>						
A <sup>+</sup> and A . . . . .	33.42	13.46	8.54	6.26	2.06	.00
E and F . . . . .	3.60	8.23	9.18	17.87	21.77	31.58
<i>Girls</i>						
A <sup>+</sup> and A . . . . .	22.45	8.29	5.42	3.12	2.38	1.96
E and F . . . . .	3.68	8.42	13.92	24.40	23.43	25.49

ous scholastic groups reveals the fact that the seniors making the highest intelligence scores (the highest half of 1 per cent of our total group) are not rated "excellent" on their school work. They are regularly rated as "high" or "good" except in the case of the boys, who are rated "medium" or "fair" as often as "high" or "good." These tables also reveal the fact that many seniors who are rated "excellent" and "high" in their school work drop rather low in intelligence scores, but never so low as those rated "medium," "fair," and "poor" in their school work. We must, therefore, conclude that other factors besides intelligence play an important rôle in determining school success.

3. Frequency of different grades of intelligence among the individuals belonging to each scholastic group. A question of special interest is the way in which the

different grades of intelligence possessed by high school seniors are distributed among the individuals belonging to each scholastic group. Frequency tables were prepared for each scholastic group, showing the percentage of individuals belonging to each intelligence rank. Frequency curves were then drawn for each group, showing the per cent belonging to the several scholastic groups who possessed each grade of intelligence from A<sup>+</sup> to F. Lack of

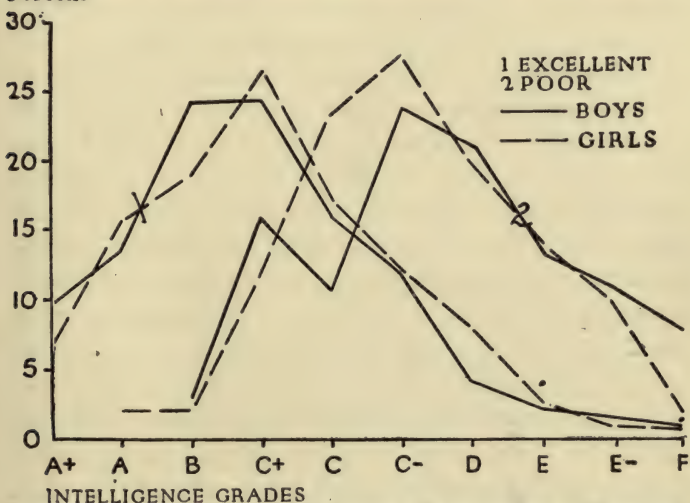


FIGURE 26. — Frequency curves showing the percentage of boys and girls making an excellent and a poor scholastic record in high school, who possess each grade of intelligence (A<sup>+</sup> to F).

space prevents us from presenting all these tables and curves. But the marked difference in the grades of intelligence possessed by the seniors making an "excellent" and "poor" rating in their high school work is shown in Figure 26.

As may readily be seen, the curves for both the boys and girls making the highest scholastic records pass far above the curves for those making the poorest scholastic rating, at all points indicating the highest grades of intelligence possessed by high school seniors, and pass just about as far below these curves at all points indicating the lowest grades of intelligence. It will also be seen that the curves for the seniors rated "excellent" in their high school work culminate at the points indicating a B and C<sup>+</sup> grade of intelligence. That is to say, a greater percentage of individuals belonging to this scholastic group possess a B and C<sup>+</sup> grade of intelligence than possess any other intelligence grade. The highest point in the curves for the seniors belonging to the group making the "poorest" scholastic rating on their high school work is found at the points indicating a C<sup>-</sup> and D grade of intelligence. The curve for the seniors making an average or "good" grade in their high school work would pass, if drawn, about midway between the curves for the best and poorest scholastic groups. The position of the curves for this average scholastic group is shown by the dots in the figure, which indicate the direction taken by the curve for this average group.

The frequency curves for the other scholastic groups show that the largest percentage of the boys belonging to the scholastic group rated "high" fell at the C<sup>+</sup> level, for the group rated "good" at the C level, and for the groups rated "medium" and "fair" at the C<sup>-</sup> level. For the girls these high points in the frequency curves fell at B and C<sup>+</sup> for "excellent" and "high," at the C<sup>-</sup> level for the "good" and "medium" scholastic groups, and at

the C- and D level for the group rated "fair" and "poor."

**4. Correlation between the intelligence of high school seniors and their scholastic success.** If the correlation between the intelligence of high school seniors and their success in school were perfect, the facts revealed in the preceding chapter would have to be interpreted as a total failure on the part of the teachers and school officials to adapt their instruction and work to the interests and mental strength of their students, unless it could be shown that our methods for measuring general intelligence and evaluating school success were unreliable to a marked degree.<sup>1</sup> If, on the other hand, these methods of measurement are reasonably reliable and adequate for making such a study of the relation between intelligence and school success as is here proposed, and if it were shown that the correlation between general intelligence and school success is rather low, it would tend to show that other factors besides native mental endowment play an important rôle in attaining school success. That there is a close relationship between general intelligence and school achievement is shown by the facts presented above. In order to measure more accurately the interdependence between these two factors, the coefficient of correlation was computed between the scores made in the mental tests and the academic grades of seniors. This was found to be .282,

<sup>1</sup> That our methods for measuring school achievement and general intelligence are not perfect is a well-known fact, but they are sufficiently accurate to give a reliable result for such comparative studies as we are making. We may, therefore, accept the degree of correlation or lack of correlation as an indication of a similarity or divergence of the functions involved.



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P. E. .05, for the boys, and .277, P. E. .04, for the girls (Pearson's formula).

More accurate computations than the above were made from our data by Mr. Emmett A. Rice in his unpublished study of "The Correlation between Scholastic Success and Scores Made on Intelligence Tests," submitted in partial fulfillment of the requirements for the degree of Master of Arts at Indiana University, June, 1920.<sup>1</sup> Mr. Rice selected at random 124 of the 276 seniors from the Shortridge, Indianapolis, high school, who took our intelligence tests and computed the correlation between the scores made on the intelligence tests and the record made in all high school subjects studied by these seniors during their four years' high school course. Special care was exercised to determine that the scholastic success attained in the various high school subjects studied would really indicate similar grades of school achievement. All members of the group took English, mathematics, and a science, and Mr. Rice showed by working out separate correlations between the various science subjects, and between all foreign language subjects studied by this group, that the various science subjects presented about the same degree of difficulty. The same was found for the foreign language subjects. Mr. Rice then computed the correlation between the average of the marks obtained in each high school subject and the intelligence score; also between the average marks obtained in all science subjects and the

<sup>1</sup> We desire to express our indebtedness and appreciation to Mr. Rice for the use of a part of his unpublished results. For complete study see master's thesis, "The Correlation between Scholastic Success and Scores Made on Intelligence Tests," Indiana University Library, June, 1920.

intelligence scores; and finally between all foreign language subjects and the intelligence scores. He then worked out the correlation between the intelligence scores and the average of the average of all scholastic grades which each student obtained during his four-year high school course.

As might be expected, the correlation coefficients obtained by this more exact method of computation, which took in the student's entire high school record, were higher than those we obtained by our method. As shown in Table XIV, the coefficient of correlation for the average of all scholastic grades is .47, P. E. .05; those for the various studies taken separately range from .25, P. E. .06, to .52, P. E. .06 (Pearson's formula).

TABLE XIV

COEFFICIENTS OF CORRELATION BETWEEN INTELLIGENCE SCORES  
AND THE AVERAGE SCHOLASTIC MARKS OBTAINED IN  
VARIOUS SUBJECTS

HIGH SCHOOL SUBJECTS	ENG.	MATH.	HIST.	TOTAL SCIENCE GROUP	ALL FOREIGN LAN- GUAGES	AVERAGE SCHO- LASTIC SUCCESS	CHEM- ISTRY	LATIN
Intelligence coefficient.	.44	.37	.25	.44	.31	.47	.52	.26
P. E.	.05	.05	.06	.05	.05	.05	.06	.06

This, like our own figures, is a positive though rather low correlation, but compares favorably with the results obtained by other investigators<sup>1</sup> who have made investigations somewhat similar to our own. Binet found a coefficient of correlation between pedagogical advance and

<sup>1</sup> Pintner, Rudolph, "Mental Survey," D. Appleton & Co., 1918, pp. 64-78.

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mental advance of .45;<sup>1</sup> Bobertag compared mental age with school marks and obtained a coefficient between poor marks and mental retardation of .52, and between good marks and mental development of .59; Pressey found a correlation between intelligence score and school marks of .48;<sup>2</sup> Terman obtained a coefficient of correlation between school marks and mental age of .45.<sup>3</sup>

It is conceivable that these rather low correlations between school achievement and intelligence may be due to inaccuracies in our methods of measuring both intelligence and school achievement. The scholastic standing of our senior group was obtained by averaging the marks made on all high school subjects studied during the junior year. This included in many individual cases such subjects as music and art, which, according to Mr. Rice's results, showed almost no positive correlation with intelligence score. For the various academic studies, the coefficient of correlation ranged from .25 for history to .52 for chemistry, covering the entire four-year period.

Another factor which may have tended to diminish our coefficient of correlation is the fact that our tests were given in so many schools (320) and that the mental examination was given by as many different teachers. This would tend to make our intelligence scores less reliable. Moreover, the school marks given to our various senior classes doubtless represent a wide variation in standards

<sup>1</sup>Stern, William, "The Psychological Method of Testing Intelligence," p. 60.

<sup>2</sup>Pressey, S. L., "The Efficiency of the Group Point Scale in Prognosticating Success and Failure in Junior High School," *Journal of Applied Psychology*, Vol. III, 1919, pp. 381-385.

<sup>3</sup>Terman, L. M., "The Intelligence of School Children," Houghton Mifflin Co., 1919, p. 79.

and reliability, being given by so many different teachers. It would, therefore, seem that the factor of intelligence might well be thought to play a somewhat larger rôle in conditioning school success than is indicated by our coefficient of correlation, a fact which must be taken into consideration in evaluating the other factors which condition school success. That this is the case is shown by the results which Mr. Rice obtained with his more accurate method of determining this correlation. But the fact that his total correlation was only .47 for a single large school and for the entire high school period, and that other correlations obtained between intelligence scores and academic success hover pretty closely about this point, seems to indicate the importance for school success of other factors besides mere intelligence. In the few investigations where a higher correlation has been obtained the intelligence scale used may contain tests which measured persistence, mental attitude, or interest, etc., in addition to mere ability to learn. Whatever the cause, the rather low correlation which we obtained, taken together with the facts revealed in the preceding chapter, must be taken into account by all who are trying to obtain from pupils in the public school or from college students academic accomplishment commensurate with their intellectual ability. That school success is vitally conditioned by native mental endowment is shown by the uniformly positive correlations obtained between intelligence score and school success. That this correlation is relatively low indicates without doubt that other factors besides intelligence enter into the making of a highly successful record in school.



5. **Why an intelligence score is not a reliable criterion of school success.** The evidence seems to indicate that we are not in reality measuring the same thing when we test for intelligence and school success. In the former case we endeavor to measure native mental endowment, the ability to learn, or the ability to adapt oneself to new situations and problems. In the latter we measure actual performance: what the student *has done* or *is doing*. The results of intelligence tests indicate what he *can do* or is *capable* of doing. School marks, on the other hand, indicate primarily what he *has done* or *is doing*; they indicate for the most part specific or actual performance; only in a secondary sense do school marks tell us anything about a student's *ability* to perform. There may, therefore, be a rather wide discrepancy between the two in particular cases.

It is further conceivable that a number of special mental factors may serve to enhance a student's school performance, factors which are quite different from general intelligence. One such factor is a good memory. This may be of far-reaching value to a pupil in attaining school success, because most of our school work to-day draws heavily upon a student's sheer ability to retain and recall. Other mental characteristics not measured by an intelligence test, such as persistence, effort, mental attitude toward school, etc., might also be possessed by a student with only average ability, and may be deficient or totally lacking in another student who has marked intelligence. The former would attain a high degree of success in school, while the latter might even fail. Other factors not mental in

character may also help to account for the low correlation. Most high schools permit students to elect a large part of their high school work. Some students may, therefore, select subjects in which they are specially interested and which are therefore easy for them. This would tend to raise their scholastic grade beyond what their native mental ability would lead us to expect. A pupil of only average or even mediocre ability may also attain marked success in school if he works hard and long, while a pupil with far superior mental ability may fail simply because the latter does not put forth sufficient effort to succeed.

**6. General summary and discussion of results.** Summarizing briefly the facts revealed by the above comparisons we may say:

1. There is a positive correlation between the intelligence score and success in school, indicating that general intelligence or ability to learn is an essential factor in determining school success. Those seniors who made the best mental rating on the intelligence tests, if taken as a group, made the best scholastic record in high school. Those making the poorest intelligence rating on the mental tests made the poorest scholastic rating. The brightest students, considered as a group, fall among those making a school record of "excellent" or "very good." The duller fall among those rated "poor" in their scholastic work.

2. The amount of interdependence which exists between these functions is indicated by the size of the coefficient of correlation between intelligence score and scholastic success or average mark earned in the various school subjects studied. This ranged for the different high school

subjects from .25 to .52; for all subjects studied during the junior year from .282 for the boys to .277 for the girls. For all subjects studied during the entire high school course by a representative group of 124 high school seniors, it was .47, P. E. .05.

3. If taken for individual cases, intelligence scores are poor criteria for predicting the kind and amount of school success that will be attained. This fact of variability in individual cases might of course be due to inaccuracies in our measurement of both functions or to accidental factors affecting the test score. It more probably indicates, when taken together with the fact that the correlation between intelligence scores and scholastic success is not very high, that other factors besides intelligence play an important rôle in attaining school success; that we are not, in reality, measuring the same functions; that mere ability to *learn* and *do* are not synonymous with actual performance; that because a pupil has the ability to *learn* or *do* his school work, it by no means follows that he will do it; or that because he has the ability or capacity he can and will properly apply it, when confronted by his tasks in school or life. A mere intelligence test is evidently no criterion for what a pupil will do in school. To what extent and in what ways it may be used to prognosticate success in school or life needs to be more carefully determined than has been done heretofore.

4. The results of this chapter throw considerable light on the maladjustments revealed in the preceding chapter. The fact that many seniors who gave unmistakable evidence that they possess superior mental ability (no stu-

dent could legitimately make a high score on the intelligence tests unless he really had the mental ability to do so) but who nevertheless fail to make school progress commensurate with that ability, and the additional fact that some seniors apparently make a marked success in their school work, who, nevertheless, give evidence of possessing only average or inferior grades of intelligence — these facts may, in the light of the data at hand, be interpreted in a number of ways. (1) The latter group of seniors may possess certain mental characteristics essential for school success other than mere ability to learn or do, such as a good memory, determination, a proper mental attitude towards their teacher and the school work, which the former lacks. (2) Such a situation may also indicate an actual mistake on the part of the teacher and the school. The work may be for many reasons ill adapted to the pupil's interests and mental strength. In such cases the failure to succeed should be charged to the school. (3) Some students making low scores on the mental tests may not have done themselves justice for a number of reasons, and may, therefore, be as bright or even more capable than the students who gave evidence of superior mental ability. But this would not account for the failure of the students who gave unmistakable signs of superior mental ability, and who were rated as failures or part failures in their school work. Such cases, it would seem, must be charged to the inefficiency of the schools.

We need to make a more careful and systematic study of the causes of school success and failure than has ever been made. We cannot safely assume that because a



pupil has superior native mental endowment he will be able and willing to use it when confronted by his school tasks. Other factors, besides native mental capacity, are doubtless essential for success in school and life. We need to determine what these factors or mental characteristics are. We ought to know why we do not get a higher positive correlation between intelligence scores and school success than we do ; why there are such marked individual exceptions to the general rule ; why one student with superior native mental endowment does not succeed in high school or college while another with lower intelligence does ; why so many boys with superior intelligence are making poor or mediocre records in high school while girls with inferior grades of native mental endowment are surpassing them in their school work.

It is evident from these and other facts revealed in this and the preceding chapter that other factors besides ability to do and learn should be taken into account when students are recommended for a university fellowship or are accelerated in school. These factors should be determined by careful and systematic investigation. A systematic and careful study of the causes of school success and failure must be made before the maladjustments revealed in this and the preceding chapter can be properly remedied.

## CHAPTER VII

### INTELLIGENCE OF SENIORS SELECTING DIFFERENT OCCUPATIONAL CAREERS

WHEN we ask what the school is able to accomplish, or what the aim of education really is, we get a variety of answers, which depend upon the wisdom of our informants and their philosophy of life. Many different opinions have been expressed upon this subject, but it may truly be said that in our educational theory and practice to-day we stand, as it were, upon the shoulders of the past. That is to say, we embody the best that the thought and experience of the race has preserved for our guidance. At different periods of man's experience with the problem of education different purposes have been emphasized as guides to educational practice. For the ancient Hebrews the chief aim of education was to inculcate goodness, to develop men and women whose every act would be pleasing in the sight of Jehovah. The Greeks were inspired by the idea of a complete, harmonious, and perfect development of the individual; and they bent all energy towards the realization of this ideal. The Romans emphasized efficiency. For them the purpose of education was to make perfect Roman citizens, capable of bearing the burdens of citizenship in the Roman state. The early Christians emphasized the idea of discipline. For them education became a mere means for developing Christian men and women, for disciplining human nature and desires,

in preparation for a better and future life. This in time broke away completely from the ideal of human perfection developed by the Greeks. Later, with the development of science and our better understanding of human nature, new ideals and purposes were emphasized and these older aims were seen with new and extended vision. The idea of training and discipline presents a curious path of development. The humanistic ideal of human perfection, originated by the Greeks, has been greatly extended and refined. The conception that education is chiefly a process of acquisition which must introduce each child into the achievements of the race; that it is a process of forming right habits of thought and action; a process of forming permanent interests in the truth and in the things which are beautiful and good; a process whereby we may secure a better adaptation to our environment; an efficient preparation for social service, etc. — these ideals have all been added to the list of purposes held and emphasized by educational leaders.

Our ideas to-day in regard to what the school should strive to accomplish are derived from the experiences of the race with the problem and from our present understanding of the meaning and purpose of human life. While all are by no means agreed with regard to details, or the means which should be employed to obtain the desired results, all would agree that education should somehow aid in securing healthy, normal, and perfect development of the individual, including the conservation and development of all his capacities and powers; that the discipline or training of certain mental abilities is important;

that the acquisition of knowledge, proper interests, and right habits of conduct and thought is essential; and that right adjustment is needed, all to the end that each individual may be so educated or trained that he will be *able* to do his full share of the world's work and be *willing* to serve his day and generation in direct proportion to his talents and capacities, which he has been taught to conserve and use in such service to the world.

In order to determine to what extent the schools of the state were practically embodying this essential feature of our present aim of education, we asked each senior taking the tests to state whether or not he had selected his life occupation, and if so, to give the name of the vocation chosen, to give the name of the study in high school which he most enjoyed, the course which he had pursued in high school, etc. These answers, together with the data collected concerning his college intentions, would, it was believed, throw important light on the extent to which these young people were being directed *towards* and prepared *for* the type of social service best suited to their mental capacities and their intellectual and social needs. Data bearing on various aspects of this problem will be presented in this and the two chapters which immediately follow.

In collecting data on the choice of an occupation, we had in mind the following specific problems: (1) to ascertain to what extent high school seniors in Indiana had actually selected the occupation which they intended to follow as a life career; (2) to compare the intelligence scores made by the group of seniors who had definitely chosen a life occupation with the record made on the tests



by those who had not, in order to determine whether more of the brightest students had selected a vocation in life than those possessing inferior grades of intelligence; (3) to obtain an exact list of the occupations chosen by high school seniors and to ascertain which occupations were being selected by the largest number; (4) to determine the general level of intelligence of the seniors selecting different occupations, by comparing the intelligence scores of the individuals belonging to each occupational group; and (5) to determine, if possible, the extent to which these young people had been preparing in high school and were definitely planning to prepare in college for the occupations chosen.

**1. Intelligence of students who had selected a life occupation contrasted and compared with the intelligence of the group who had not.** Our first problem was to ascertain whether the students who had selected a life occupation ranked higher on the intelligence tests than the group who had not. It might naturally be supposed that the brightest students would be thinking more about the choice of an occupation than the seniors of only average or inferior ability.<sup>1</sup> The data were, therefore, examined and the results compiled with this question in mind. It was found that a total of 64 per cent of the boys and 60 per cent of the girls stated that they had selected a vocation in life;<sup>2</sup> 36 per cent of the boys and 40 per cent of the girls had either not decided, or failed

<sup>1</sup>This would be expected unless the fact that those with inferior intelligence who are forced to drop out of school or who have been contemplating going to work are forced to decide and think about making a vocational choice more than their classmates.

<sup>2</sup>The fact that approximately two-thirds of our total senior group had chosen their vocation in life is a rather unexpected result. This is par-

to answer the question.<sup>1</sup> The scores made on our intelligence tests by these two groups were then studied with a view of determining (1) the general level of intelligence of each group; (2) the percentage of individuals belonging to each group possessing the highest and lowest grades of mental ability; and (3) the relative frequency with which each grade of mental ability was found among the members of the group.

The best indication of the general level of intelligence of these two groups of seniors is the median and 25 and 75 percentile scores; in other words, the record made by the middle 50 per cent of the students belonging to each group. These figures, together with the per cent belonging to each group who made scores above the median for our total or standard group, are shown in Table XV.

ticularly true when we compare this situation with the condition found in most liberal arts colleges to-day, where most students still seem to be adrift, so far as the choice of an occupation is concerned. At first thought one might be inclined to regard this result with suspicion; inferring that the answers were not genuine, but hastily given, because it was suggested to them that they should have chosen a vocation in life. This does not seem to be the case. In working over all our data on this point we became convinced somewhat against our will that the choices made were genuine. Most of these young people were actually preparing or definitely planning to prepare for the occupations chosen. It should also be remembered that, taken as a group, they are not really comparable with the average group of college students. Many of the high school seniors who had not selected a life occupation expected to go to college. Those whose school days were practically over had been thinking about what they expected to do. These facts, taken together with the fact that vocational education and vocational guidance have been specially emphasized for a number of years by Indiana high schools, many of them having regular vocational directors, will help to explain this rather unusual result.

<sup>1</sup> Only 59 per cent of the boys and 56 per cent of the girls named the exact occupation which they expected to follow as their life work. (See Table XVI.)

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TABLE XV

SCORES MADE BY MIDDLE 50 PER CENT OF SENIORS WHO HAD  
SELECTED A LIFE OCCUPATION

GROUPS COMPARED	25 PER- CENTILE	MEDIAN	75 PER- CENTILE	PER CENT ABOVE STATE MEDIAN	CASES
Occupations selected . . .	124.17	137.28	148.70	50.59	3538
Occupations undecided . .	123.28	136.31	148.23	49.00	2210

Another indication of the general level of intelligence possessed by each of these groups is given by the curves in Figure 27, showing the scores obtained by various proportionate groups of boys and girls who had (1) selected and (2) not selected their vocation in life. From the data given in Table XV and the percentile curves shown in Figure 27 it may be seen that the score made on the tests by the seniors who had selected a vocation in life are slightly higher than those made by the group which had not. But the difference is so small that it may have little or no significance.

But this result might be obtained even if the brightest students in our total group had selected their life occupation. Enough students possessing a high average grade of intelligence might be undecided to even up the scores of the two groups when compared on the basis of central tendency alone. We were, therefore, interested to know whether a larger percentage of individuals belonging to the group who had selected an occupation were rated A or B than were found among the group who had not. Figure 28 compares the percentage of individuals belonging to

each group rated A or B, also the percentage belonging to each group who possessed the lowest (D, E, or F) grades of

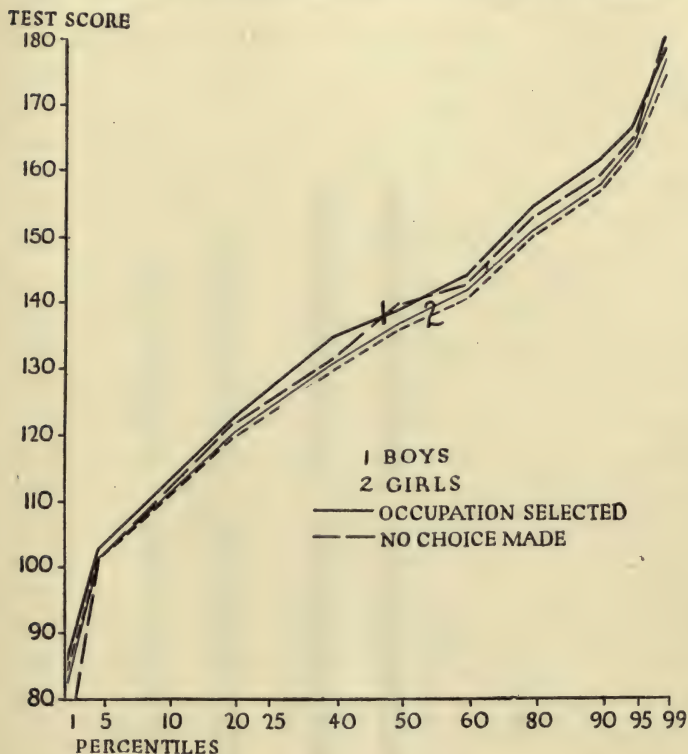


FIGURE 27. — Curves showing scores obtained by various percentile groups of boys and girls who had and had not selected their life occupation.

mental ability. A mere glance at this figure will show how slight is the difference between the two groups. There are about as many individuals rated A or B in the group



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who had not selected an occupation as in the group that had named the vocation which they expected to follow as their life work.

If we carry our analysis a step further, however, and

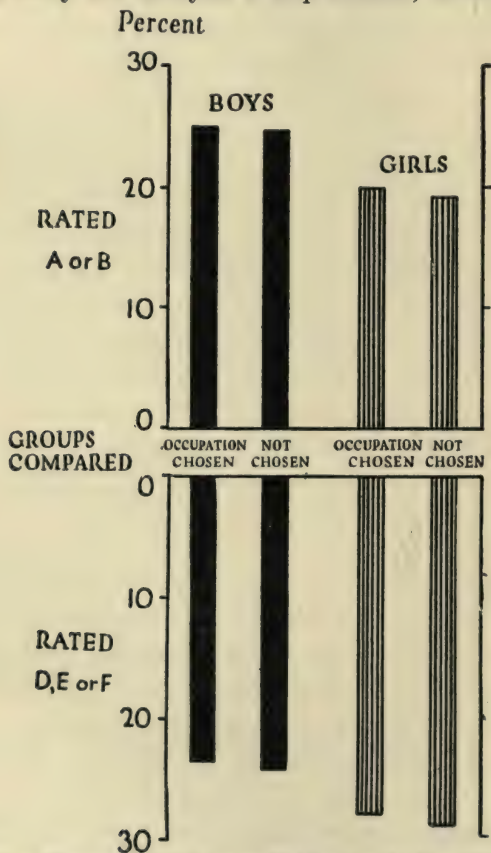


FIGURE 28. — Percentage of boys and girls who had and had not selected their life occupation, making the highest (A or B) and the lowest (D, E, or F) intelligence ratings on the mental tests.

compare the percentage of boys and girls who earned a mental rating of A<sup>+</sup> or A on the tests, we find a more noticeable difference in favor of the group which had selected a vocation in life. Of the boys belonging to this group 10.47 per cent made a mental rating of A<sup>+</sup> or A on the tests, as against 7.58 per cent for the group who had not selected a vocation. Among the girls the difference is less — 7.21 per cent for the group who had decided upon a vocation, and 6.53 per cent for the group who had not.

The above results may be interpreted to mean that little thought is being given by high school seniors to the matter of choosing their vocation in life. Those indicating a definite choice rated only very slightly higher on the mental tests than did the group that had made no choice. The percentile curves run along almost together for both boys and girls. (See Figure 27.) The percentage of boys rated A or B was only slightly higher for the group that had selected their life occupation, and the percentage of the total group rated D, E, or F was only slightly lower than for the group that had not. (Compare Figure 28.) But there is some evidence that the brightest boys, those rated A<sup>+</sup> or A, are more concerned about their future life work than those possessing the lower grades of ability. The most significant fact revealed by the comparisons, however, seems to be that there is so little difference between these two groups. This may be accounted for in part by the fact that so many of the brightest seniors going to college had not chosen their vocation in life, while practically all of those not planning to go to college had come to a place where some decision had to be made.

**2. Intelligence of seniors selecting different occupational careers.** While the difference in scores made by the group of seniors who had selected a life occupation and of those who had not is very slight, as we have seen, there is a marked difference between the intelligence ratings made by the groups selecting different occupations, as was shown by comparing the records each group made on the mental tests. In order to compare the grades of intelligence possessed by the various occupational groups we classified the various occupations chosen into the following classes:

(1) *Physician*, including doctors, surgeons, osteopaths, etc.; (2) *Teacher*, all kinds, including teachers of music and physical culture; (3) *Scientist*, including chemists, biologists, sociologists, research specialists, etc.; (4) *Engineer*, mechanical, electrical, civil, mining, and chemical; (5) *Business and commercial pursuits*, merchant, advertising, real estate, banking, salesman, etc.; (6) *Lawyer*; (7) *Journalist*, including author, editor, writer, etc.; (8) *Clerical worker*, including clerking, office work, clerk in bank, bookkeeper, secretary, stenographer, etc.; (9) *Skilled mechanic or artisan*, including such tradesmen as telegrapher, painter, decorator, jeweler, glass worker, carpenter, etc.; (10) *Social worker*, missionary, church work, Y.M.C.A., etc.; (11) *Entertainer*, reader, Chautauqua lecturer, actor, etc.; (12) *Nurse*; (13) *Musician*; (14) *Farmer*; (15) *Homemaker*; (16) *Minister*.

The occupations chosen by the largest number of individuals may be readily selected from the list contained in Table XVI by noting the number of seniors who selected each occupation.

TABLE XVI  
LIFE CAREERS CHOSEN BY HIGH SCHOOL SENIORS

Boys		Girls	
<i>Occupations</i>	<i>Cases</i>	<i>Occupations</i>	<i>Cases</i>
Physician.....	51	Physician.....	36
Teacher.....	75	Teacher.....	905
Lawyer.....	69	Lawyer.....	26
Scientist.....	41	Scientist.....	1
Engineer.....	432	Engineer.....	3
Business.....	151	Business.....	0
Journalist.....	16	Journalist.....	18
Clerical worker.....	10	Clerical worker.....	646
Skilled mechanic.....	182	Skilled artisan.....	4
Social worker.....	3	Social worker.....	22
Entertainer.....	4	Entertainer.....	16
Musician.....	5	Musician.....	128
Farmer.....	327	Farmer.....	8
Minister.....	12	Nurse.....	101
		Homemaking.....	10

Our second problem was (1) to ascertain the general level of intelligence of the seniors who had selected each of these lines of work; (2) to ascertain which occupations were attracting the brightest high school seniors; and (3) to determine whether students possessing very superior, average, inferior, and very inferior grades of ability were going into each of these lines of work in about equal numbers or whether some occupations were drawing the brightest students, others those with only average ability, and still others attracting students who possess the more inferior grades of intelligence. Data bearing on each of these questions will be presented in order in the following tables and curves.

(a) *General level of ability of the seniors selecting different occupations.* Figures 29 and 30 show the records made by the middle 50 per cent of the boys and girls



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selecting different occupations. The horizontal bars indicate the 25 percentile, the median, and 75 percentile score for each occupational group and will enable the reader to compare at a glance the various occupational groups with the state standard and with each other on the basis of central tendency.

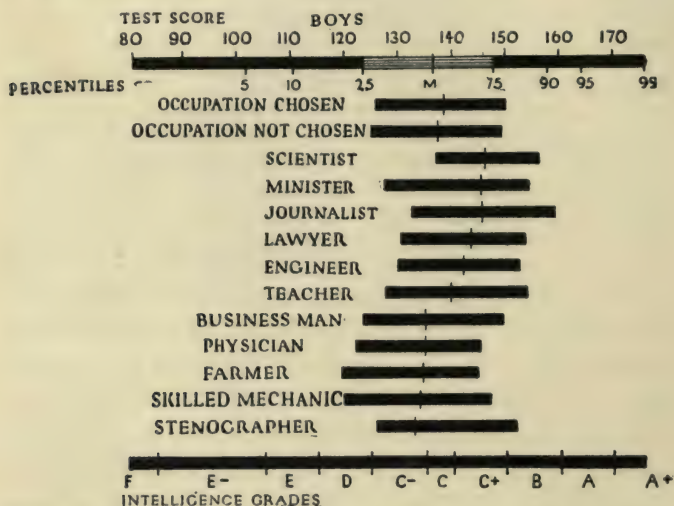


FIGURE 29. — Scores obtained by the middle 50 per cent of senior boys choosing different occupations.

It may readily be seen from Figure 29 that the group of boys selecting science, the ministry, and journalism rank ahead of all other groups. Those selecting business, medicine, farming, a skilled trade, or stenography and book-keeping rank below every other occupational group. Law, engineering, and teaching occupy a position about midway between these other occupations.

The girls selecting journalism, law, and social service rank higher than any other occupational group. (See Figure 30.) The groups selecting clerical work, nursing, and the professions of music and art rank lowest on the intelligence tests; the groups selecting medicine, teaching, and homemaking occupy positions about midway between.

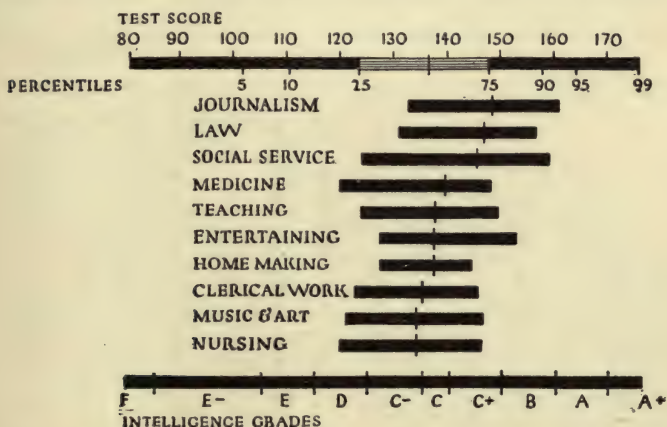


FIGURE 30. — Scores made by the middle 50 per cent of senior girls choosing different occupations.

Another method for measuring the general level of intelligence of these several occupational groups which might be used is to calculate the percentage belonging to each occupational group who made scores above the state median. Table XVII gives data on this point and shows also the median score for each group. An inspection of the table will show that the several occupational groups occupy the same relative positions in this comparison that they did in the comparisons made in Figures 29 and 30

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above. The engineering group has a slightly higher percentage of boys making scores above the state median than we might expect from the former comparison, due to the fact that a large percentage of the prospective engineers made only an average (C) or high average (C<sup>+</sup>) score on the tests.

TABLE XVII

PER CENT SELECTING DIFFERENT OCCUPATIONS WHO MADE SCORES ABOVE STATE MEDIAN

OCCUPATION	PER CENT ABOVE STATE MEDIAN		MEDIAN SCORE FOR GROUP	
	Boys	Girls	Boys	Girls
Scientist . . . . .	73.00	.....	146	...
Minister . . . . .	63.34	.....	146	...
Journalist . . . . .	62.50	66.67	146	148
Lawyer . . . . .	59.42	67.70	143	147
Engineer . . . . .	63.24	.....	142	...
Teacher . . . . .	54.13	51.38	139	138
Business . . . . .	49.75	.....	137	...
Physician . . . . .	46.27	51.67	135	140
Artisan . . . . .	44.50	.....	134	...
Farmer . . . . .	40.36	.....	134	...
Clerical worker . . . . .	40.00	45.35	133	135
Social service . . . . .	.....	63.64	...	145
Homemaking . . . . .	.....	50.00	...	138
Music and art . . . . .	.....	43.75	...	135
Entertainer . . . . .	.....	50.00	...	138
Nurse . . . . .	.....	43.16	...	134

(b) *Occupations selected by the brightest and dullest seniors.* If we study the range of intelligence possessed by the seniors belonging to these various occupational groups, we find some rather significant shiftings in rank. Figures 31 and 32 show the percentage of boys and girls

selecting each occupation who obtained the highest (A or B) and the lowest (D, E, or F) intelligence ratings. As may readily be seen from an inspection of Figure 31, journalism, the ministry, and science still occupy first place for the boys, but the order is reversed — journalism comes first, science third. The business, skilled mechanic, farming, and physician groups drop to the lowest rank,



FIGURE 31. — Percentage of senior boys choosing different occupations who made the highest (A or B) and the lowest intelligence ratings on the tests.

while the group selecting clerical work shifts from the lowest to a middle position.

Among the girls fewer shifts occur. Those choosing journalism, law, and social service still stand at the head of the list and in the same order as before. Nursing, stenography, and music stand at the bottom of the list.



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Those electing medicine occupy a position lower down in the scale, showing that more seniors elect this occupation who possess only average ability than were found among the group electing teaching and the other occupations.

If an occupational group ranks high in central tendency, we cannot, therefore, conclude that it will rank high in the percentage of seniors who possess the highest grades of

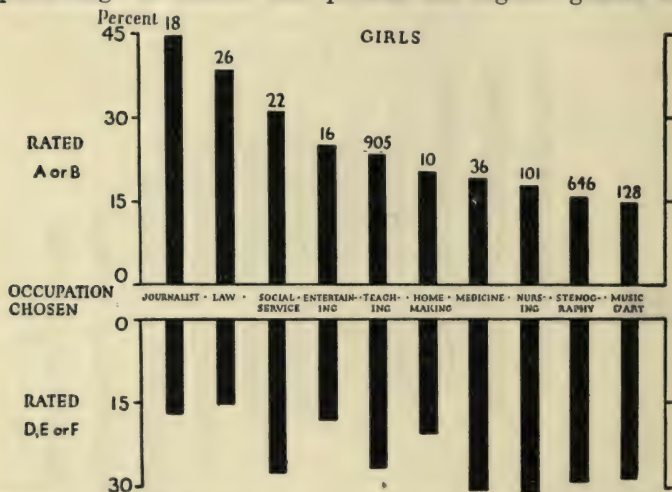


FIGURE 32. — Percentage of senior girls choosing different occupations who made the best (A or B) and the worst intelligence ratings on the tests.

intelligence found among high school seniors. There are some notable illustrations of this fact. Some very bright boys elect clerical work, while the general level of ability of this group, taken as a whole, was very low. In the per cent of students rated A or B this occupational group ranks sixth. In median score and in the per cent belonging to the group who scored above the state median it stands

at the bottom of the list. In the per cent of students belonging to the group rated A or B, journalism comes first; in the per cent of students belonging to this group scoring above the state median it ranks fourth. The group electing engineering ranks third in central tendency but seventh in the per cent belonging to the group who were rated A or B. For the girls the different grades of ability are more evenly distributed throughout the several occupational groups. The more important differences revealed by these comparisons are shown by the data presented in Table XVIII.

TABLE XVIII

INTELLIGENCE RANKING OF SENIORS CHOOSING DIFFERENT OCCUPATIONAL CAREERS

PER CENT RATED A OR B	PER CENT ABOVE STATE MEDIAN	MEDIAN SCORE FOR GROUP
<i>BOYS</i>		
Journalism . . . 43.75	Science . . . 73.00	Science . . . . 145.68
Ministry . . . . 41.67	Ministry . . . 63.34	Ministry . . . . 145.50
Science . . . . . 41.46	Engineer . . . 63.24	Journalism . . . 145.50
Teacher . . . . . 33.34	Journalism . . 62.50	Lawyer . . . . . 143.20
Lawyer . . . . . 31.89	Lawyer . . . . 59.40	Engineer . . . . 142.00
Clerical . . . . . 30.00	Teacher . . . . 54.13	Teacher . . . . . 139.00
Engineers . . . . 29.86	Business . . . 49.75	Business . . . . 136.83
Business . . . . . 22.88	Physician . . . 46.27	Physician . . . . 135.00
Mechanic . . . . . 17.58	Mechanic . . . 44.50	Farmer . . . . . 134.40
Farmer . . . . . 16.20	Farmer . . . . 40.36	Mechanic . . . . 134.25
Physician . . . . 11.76	Clerical . . . . 40.00	Clerical . . . . . 133.34
<i>GIRLS</i>		
Journalist . . . . 44.45	Lawyer . . . . 67.70	Journalist . . . 148.34
Lawyer . . . . . 38.46	Journalist . . . 66.67	Lawyer . . . . . 147.00
Social service . . 31.36	Social service 63.63	Social service . 144.50
Entertainer . . . 25.00	Physician . . . 51.67	Physician . . . . 139.50
Teacher . . . . . 23.64	Teacher . . . . 51.38	Teacher . . . . . 137.65
Homemaking . . . 20.00	Entertainer . . 50.00	Entertainer . . . 137.50
Physician . . . . . 19.45	Homemaking 50.00	Homemaking . . . 137.50
Nurse . . . . . 17.82	Clerical . . . . 45.55	Clerical . . . . . 135.20
Clerical . . . . . 16.10	Music and art 43.75	Music and art . . 134.69
Music and art . . 15.62	Nurse . . . . . 43.16	Nurse . . . . . 134.17

(c) *Number in each occupational group scoring at various intelligence levels.* Other important differences between the several occupational groups are revealed by the distribution tables for each group and the tables (not printed in this study) constructed to show the per cent of seniors belonging to the several occupational groups who possess each grade of intelligence from A to F. Frequency curves drawn from the data contained in these tables picture graphically the percentage of students selecting each occupation who possess each grade of ability found among high school seniors. Sample curves are shown in Figures 33 to 39.

These frequency curves and the data contained in the distribution tables for the several occupational groups showed not only the inequalities in mental strength found among the seniors selecting different occupations, but other significant differences. For example, seniors making an A<sup>+</sup> rating on the tests often select an occupation which was regularly chosen by seniors possessing the lowest grades of mental ability found among high school seniors. This is particularly true for the girls choosing stenography and teaching. Many girls electing teaching made the lowest scores obtained by any high school seniors. Others electing teaching as a profession possessed the highest grades of ability found among our total or standard group. In this occupation there is an opportunity for advancement and for the exercise of the full mental capacities of the brightest girls; but it may be questioned whether the brightest seniors in the entire state would find adequate exercise for their mental powers if they engaged in mere stenographic or clerical work, which they selected, not to mention

the unfortunate condition that the dullest high school seniors in the state expect to enter the teaching profession.

Figure 33 gives the curves for the boys selecting science and farming. The fact that a much larger percentage of the scientist group possess A<sup>+</sup>, A, B, and C<sup>+</sup> grades of Percent

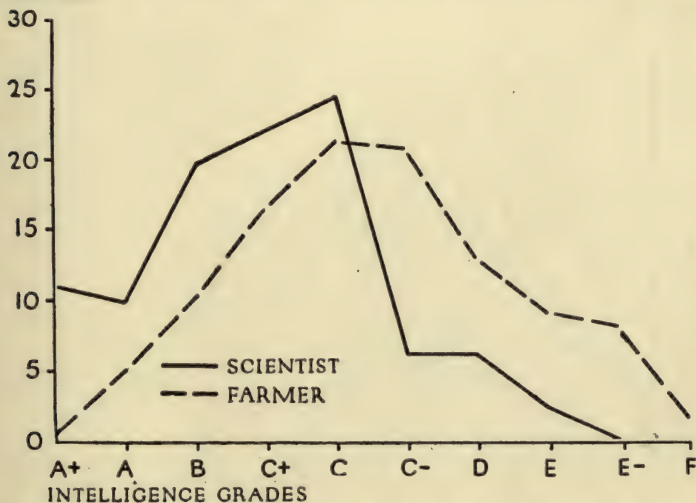


FIGURE 33. — Frequency curves showing the percentage of boys possessing each grade of intelligence who selected farming and science as their vocation in life.

intelligence than is the case for the farmer group is shown by the position of the two curves at the points indicating these highest grades of intelligence. That the farmer group possesses a much larger percentage of boys making the lowest mental ratings in the tests is shown by the rise of the farmer curve at the points indicating the C<sup>-</sup>, D, E, and F grades of intelligence.



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Figure 34 shows the per cent of students belonging to the groups choosing a skilled trade, a business career, and the ministry that possess each grade of mental ability from A<sup>+</sup> to F. Figure 35 compares the lawyer, teacher, and physician groups on the same basis, while Figures 36, 37,

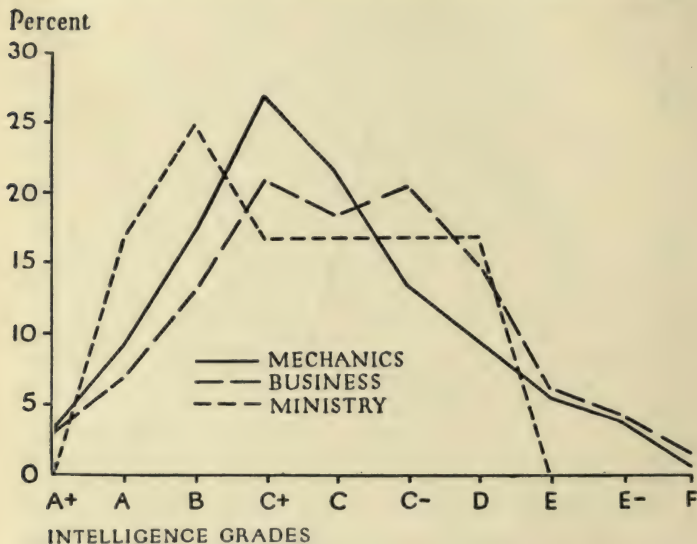


FIGURE 34. — Frequency curves showing the percentage of boys choosing a skilled trade, business, and the ministry who possess each grade of intelligence from A<sup>+</sup> to F.

and 38 compare representative groups of girls electing different occupations. Figure 36 compares the groups selecting teaching and nursing. Figure 37 compares the group selecting journalism with the group electing music and art, while Figure 38 compares the girls selecting law with those selecting stenography or secretarial work.

These figures and curves speak for themselves, but the following facts should be emphasized.

1. The relatively large number of boys belonging to the group electing science who possess the highest grades of intelligence, *i.e.* making an A, B, and C<sup>+</sup> rating, and the large percentage of boys selecting farming who possess the lowest grades of intelligence, *i.e.* making an intelligence rating below C<sup>-</sup>.

Percent

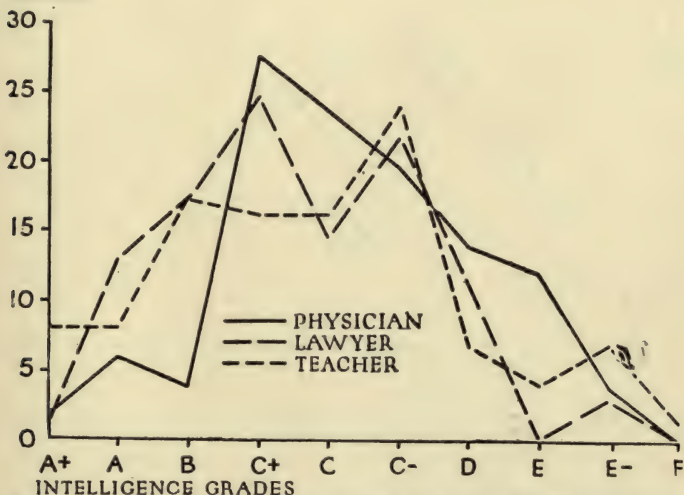


FIGURE 35. — Frequency curves showing the percentage of boys choosing law, teaching, and medicine who possess each grade of intelligence found among our total or standard group.

2. The fact that such a large percentage of the boys who selected medicine and a skilled trade possess only average mental ability.<sup>1</sup>

<sup>1</sup> Compare the occupational intelligence standards obtained by the mental examinations made in the army, Army Mental Tests, p. 23, Washington, D. C., November 22, 1918.

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3. The inequalities in mental strength found among the students selecting the same occupation ; compare, for example, the range of intelligence in the prospective teaching and clerical groups.

4. The comparatively low grades of intelligence pos-

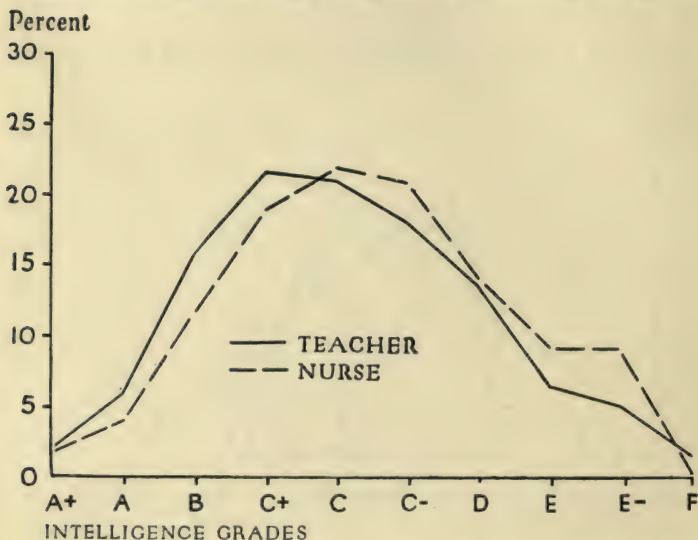


FIGURE 36. — Frequency curves showing the percentage of girls choosing teaching and nursing who possess each grade of intelligence from A<sup>+</sup> to F.

essed by the groups selecting business, farming, and clerical work.

3. Extent to which high school seniors are preparing for the life occupations selected. The extent to which these young people had prepared in high school or were definitely planning to prepare in college for the occupations chosen is shown in a number of ways. A com-

parison of the occupations selected and the seniors' favorite subject in high school indicates the extent to which their occupational choice was in line with their general interest and probable capacity. The results of this comparison show that the boys select occupations which are in harmony with their chief interests. There is a positive indication in our data that the high school study in which

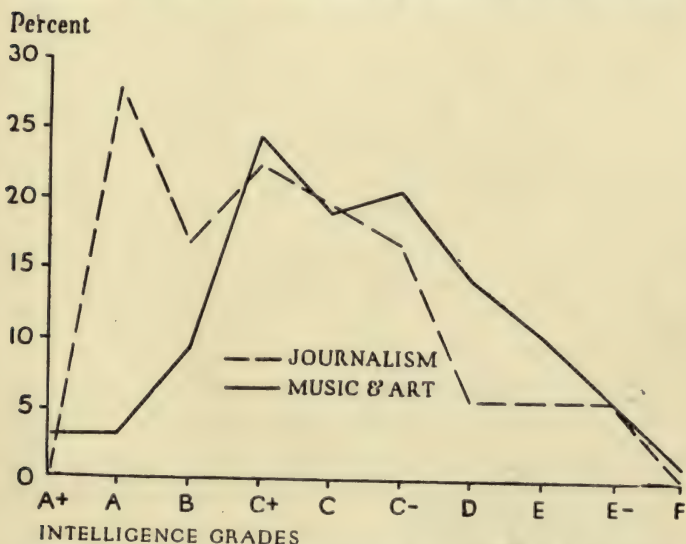


FIGURE 37. — Frequency curves showing percentage of girls choosing journalism and music or art who possess each grade of intelligence found among high school seniors.

these students were specially interested is a determining factor in their choice of an occupation. (Compare Chapter IX below.) A few had decided early in their high school career what occupation they expected to follow and had shaped their course in high school so as to prepare for it.



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This is true of most of those who were completing a vocational course. Many of those intending to attend college had also been preparing in high school for the occupation chosen and were definitely planning to prepare in college for the vocation selected. This was indicated by the fact that they had taken the course in high school giving the best basis for the occupation chosen and that they had

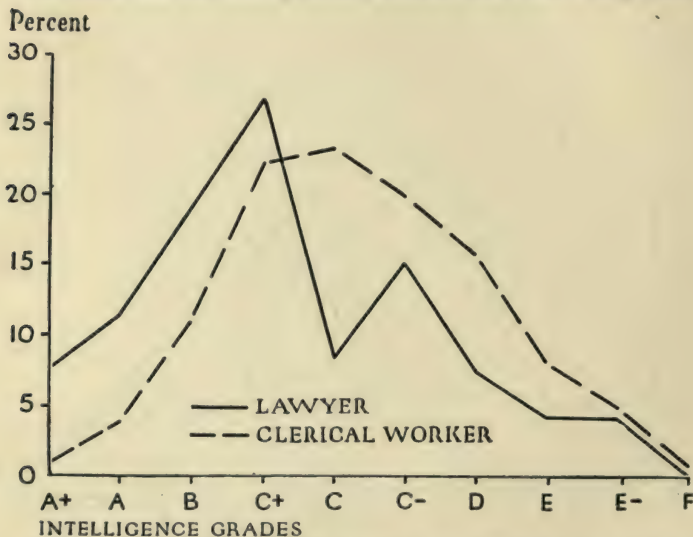


FIGURE 38. — Frequency curves showing the percentage of girls selecting clerical work and law who possess each grade of intelligence found among high school seniors.

selected a college which would fit them for the occupation they had chosen. The effect which their choice of a high school course had upon their choice of an occupation and upon their college intention is shown in the following chapter. The extent to which these seniors were planning to

prepare in college for the occupation selected is shown best by their college intentions as set forth below.

Our tabulations were made in such a way (by making use of initial letters, special characters, and different colored inks) that we could ascertain the percentage of students choosing each occupation who were (1) going to college; (2) not going to college; (3) going to a college of liberal arts; (4) going to a technical or professional school; and (5) the percentage who had not decided what kind of college they would attend. These comparisons revealed the following facts:

1. The high school seniors who had selected a life occupation not only knew the requirements for the occupation selected, but they were actually planning to attend the type of college and to take the kind of course which would give them the best possible preparation for the work in life which they had selected. All of the prospective ministers stated that they were going to college, 75 per cent of them selecting a college of liberal arts. Of those expecting to be engineers 96 per cent stated that they would attend college next year, and all but one of this group stated that they were going to an engineering or technical college. Only one was undecided in regard to the kind of college he expected to attend. Of the prospective lawyers 97 per cent had definitely decided to go to college and 100 per cent of this group were planning to go to a professional school. Of the group selecting medicine 92 per cent stated that they expected to go to college and 82 per cent of this group selected a professional school. Of those selecting the profession of teaching 95 per cent

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were going to college and 87 per cent of this number expected to attend a normal school or a liberal arts college. Only 66 per cent of the skilled artisan group and 54 per cent of the group going into business expected to attend college. Most of the skilled mechanics (56 per cent) were going to a technical school, and 30.5 per cent of those going into business selected a college of liberal arts. Of the prospective farmer group only 5 per cent expected to go to college, and only 27 per cent of this number expected to attend an agriculture college. (See Table XIX.)

TABLE XIX

PER CENT OF BOYS CHOOSING EACH OCCUPATION WHO ARE GOING TO COLLEGE

OCCUPATIONS SELECTED	PER CENT GOING TO COLLEGE	PER CENT NOT GOING TO COLLEGE	PER CENT GOING TO TECHNICAL COLLEGE	PER CENT GOING TO LIBERAL ARTS COLLEGE	PER CENT WHO HAVE NOT SELECTED THEIR COLLEGE
Physician . . . . .	92.16	7.84	82.24	3.92	.....
Minister . . . . .	100.00	.....	8.33	75.00	16.67
Teacher . . . . .	94.66	5.33	4.00	86.66	4.00
Scientist . . . . .	93.18	6.82	79.54	6.82	6.82
Engineer . . . . .	96.05	3.95	95.82	.....	.23
Business. . . . .	53.90	46.10	3.90	30.52	19.48
Lawyer . . . . .	96.93	3.07	.....	96.93	.....
Journalist . . . . .	93.75	6.25	.....	75.00	18.75
Bookkeeper and stenographer	50.00	50.00	.....	20.00	30.00
Skilled mechanic . . . . .	65.55	34.55	56.11	1.11	8.33
Farmer . . . . .	58.84	41.16	26.69	6.75	25.40

2. While the basic conditions for selection and preparation for the occupations chosen seems, therefore, to be fairly satisfactory, the most significant fact revealed by the

above comparisons does not appear on the surface ; namely, the small number of occupations actually selected by this large group of high school graduates. Only 16 lines of work were chosen by the 6188 high school seniors. Of the girls selecting a definite occupation 81 per cent chose stenography or teaching ; 80 per cent of the boys chose only four lines of work. This shows rather clearly that our high schools are poorly adapted to meet the vocational interests and needs of all classes of students, and are not adequately meeting the vocational needs of the state. Our results on this point show that the high school prepares *for* and directs young people *towards only* a few standard occupations ; that they are not, in fact, institutions meeting the interests and needs of their students or the vocational needs of the state. Many of these seniors are more or less adrift, so far as their life work is concerned. Others are selecting work ill adapted to their native mental strength. *All seem to need more efficient educational and vocational guidance than our high schools are at present able to give them.*

**4. General summary and discussion of results.** Summarizing briefly the results obtained in this chapter we have the following:

1. About two-thirds of the seniors taking our tests had chosen their vocation in life. The number is slightly greater among the boys (64 per cent) than among the girls (60 per cent).

2. Only 16 different lines of work were chosen by our total group of more than 6000 seniors. Some of these occupations were selected by so few seniors as to make



them almost negligible. The occupations selected most often by the boys were engineering (31 per cent) and farming (24 per cent); by the girls teaching (47 per cent) and clerical work (34 per cent). These results suggest that the high schools of the state are not meeting the vocational needs of their students as well as they should. We have boys and girls coming into our high schools from all classes and occupational groups. The high school is unconsciously directing them towards a few lines of work — the traditional professions. Many of these seniors are adrift so far as the selection of their life work is concerned. Others are selecting occupations and actually preparing or planning to prepare for lines of work ill adapted to their mental strength. It is clear that these young people need more efficient vocational guidance than our high schools are at present able to give them. Our results clearly show that they are planning to prepare for the occupations chosen on the basis of their limited high school experience and without the skilled advice needed to enable them to make a choice in accordance with their mental abilities, not to mention the opportunities offered for economic success in the occupation selected.

3. From the data collected it further appears that little thought is being given by high school seniors to the matter of selecting their vocation in life. Those having selected an occupation rank only slightly higher on the tests, if taken as a group, than the seniors who had not done so. There is almost no difference between the two groups in central tendency and there are about as many seniors ranked A or B in the group which had not selected

a life occupation as in the group which had selected a vocation in life. The brightest boys, those rated A<sup>+</sup>, seem, however, to have decided in larger numbers than those with more inferior grades of ability.

4. There is a marked difference in the intelligence of the seniors selecting different occupational careers. The boys going into the ministry, journalism, and science rank intellectually above other occupational groups both in central tendency and in the percentage of individuals belonging to the group who make the highest intelligence ratings made by high school seniors. Those selecting medicine, business, and farming make the lowest ratings in the tests. Those selecting law, engineering, and teaching occupy a position about midway between. The girls selecting journalism, social service, and law rank above every other occupational group. Those selecting clerical work, nursing, music, or art, if taken as a group, rank lowest in the intelligence test; the group selecting teaching, medicine, and homemaking, taken as a whole, occupy a middle position, and these rankings remain the same whether we compare them on the basis of central tendency or percentage of the total group possessing the higher grades of intelligence.

5. The brightest senior boys in the state selected science and engineering. The dullest boys selected farming. Those selecting certain professions, notably medicine, possess only average mental ability for high school seniors; they are only on a par mentally with the group selecting a skilled trade, a very significant fact, if generally true, for our coming physicians.

6. The range in intelligence within certain of these

occupational groups is very great. Many girls electing the profession of teaching make the lowest intelligence rating made by high school seniors; others make the highest. The brightest senior girls in the entire state selected clerical work, though the average intelligence rating for this occupation is very low. Similar inequalities occur among the male occupational groups. In some of these occupations there is opportunity for the exercise of the full mental capacities and powers of the brightest students; in others there is need for only inferior intelligence. The latter occupations were nevertheless selected by the brightest seniors in the state, not to mention the unfortunate condition that the dullest seniors are selecting such occupations as teaching, medicine, and nursing in large numbers, which clearly demand the exercise of a mental equipment beyond their native mental powers.

These and other facts revealed in this chapter point to a clearly defined need for wiser vocational direction for high school seniors, guidance which will at least adjust the occupation chosen to the mental strength of the individual. In no other way will we be able to conserve and economically cultivate the full capacities and talents of the young people of the state.

7. Our results show further that the seniors who had chosen their occupation not only knew what is necessary to prepare for the vocation selected, but they are in nearly every case definitely planning to prepare for the occupation chosen, a fact which emphasizes still further the need for wiser vocational and educational direction in high school.

## CHAPTER VIII

### INTELLIGENCE OF SENIORS PURSUING DIFFERENT COURSES IN HIGH SCHOOL

SEVEN curricula, differing rather widely in subject matter, requirements for graduation, and purpose were offered in the high schools coöperating in this study — the classical, academic, scientific, general, college preparatory, commercial or business, and so-called vocational courses.<sup>1</sup>

Many educational traditions cluster around some of these courses. There is also a tendency on the part of many teachers and parents to attach greater educational importance to some of these courses than to others. Some of them, with the emphasis given to certain subjects, have been forced into the high school by influences from without the school ; and it has often been charged that parents and teachers advise the brightest or most ambitious students to take certain of these courses in preference to others. We desired, therefore, to compare the scores made on the intelligence tests by the seniors who were completing each type of course, to ascertain : (1) which course was attracting the ablest students graduating from the high schools of the state ; (2) which course was sending most students

<sup>1</sup>It should be pointed out that the traditional high school curricula designated by these various names have been very materially modified in Indiana in recent years in order to modernize the high school course and to attempt to adapt it more nearly to the varying needs of all classes of students. See manual for course of study for Indiana high schools, Department of Public Instruction, Bulletin No. 35, 1918.



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to college; (3) what effect, if any, the course pursued in high school was having upon the selection of an occupation and the selection of a college course; and (4) the courses pursued by the largest number of seniors who were accelerated or retarded by the school.

It should be pointed out at the beginning, however, that only a few of the high schools giving the tests offered all of these courses. Some offer only two, three, four, or five. The chances for a senior to elect each of these courses were, therefore, not equal, since the choice in many schools was limited. Notwithstanding this fact our results are clear and striking. Table XX shows the number of boys and girls who were successfully completing each type of high school course.

TABLE XX

NUMBER OF SENIORS GRADUATING FROM EACH TYPE OF HIGH SCHOOL COURSE

GROUPS COMPARED	COURSES OFFERED							
	General	Academic	Commercial or Business	College Preparatory	Vocational	Classical	Scientific	Total Cases
Boys . . . . .	1209	799	86	101	40	41	30	2306
Girls . . . . .	1811	1059	278	139	74	70	11	3442
Total . . . . .	3020	1858	364	240	114	111	41	5748
Per cent . . .	52.54	32.32	6.33	4.17	1.98	1.93	.71	99.98

1. General level of intelligence of the seniors completing each type of high school course. The best indication of the general level of intelligence of the seniors completing each type of high school course is shown by the

record made by the middle 50 per cent of the students graduating from each course. Figure 39 presents these data for each of the seven courses and shows that the students pursuing the classical course rank highest on the tests while those completing a vocational course rank lowest; that those completing the classical course rank about as far above the state standard as those completing a vocational course rank below it; that the number

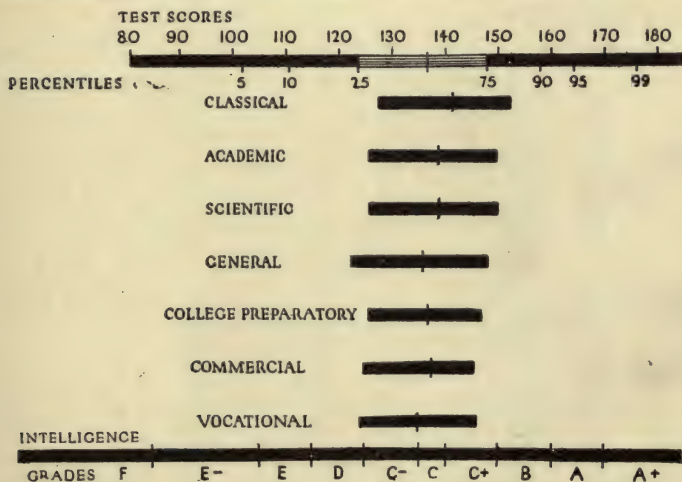


FIGURE 39. — Scores made by the middle 50 per cent of seniors graduating from each type of high school course.

of students graduating from these two courses are equal; that the students completing other types of courses rank somewhere in between these extremes, arranging themselves in the following descending order: academic next to classical, then scientific, general, college preparatory, commercial, and vocational. It should also be pointed out

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that the seniors pursuing the academic and scientific courses rank above the state standard in median scores, while those pursuing the general and vocational courses fall below it.

**2. Range in intelligence of the seniors pursuing different courses.** We were also interested to ascertain which high school course attracted the brightest seniors and which the dullest. Information on this point is given in Table XXI and Figure 40. Table XXI shows the per cent of students graduating from each type of high school course who obtained an A or B rating on the intelligence tests; also those who made an inferior (D, E, or F), and an average (C<sup>+</sup>, C, or C<sup>-</sup>) rating. For the information of the reader we have also included in this table the median scores for these several course-groups and the percentages making scores above the median for our total or standard group.

TABLE XXI

PER CENT OF STUDENTS GRADUATING FROM EACH COURSE WHO POSSESS DIFFERENT GRADES OF ABILITY

PER CENT RATED	CLAS- SICAL	ACA- DEMIC	SCIEN- TIFIC	GEN- ERAL	COL- LEGE PRE- PARA- TORY	COM- MER- CIAL	VOCA- TIONAL
A or B . . . .	28.80	24.86	24.34	20.73	17.50	16.20	15.79
D, E, or F. . .	20.70	24.00	24.40	29.23	21.24	26.92	25.43
C <sup>+</sup> , C, or C <sup>-</sup> .	50.50	51.13	51.21	50.04	61.26	56.88	58.78
Per cent above state median	58.25	53.60	56.10	47.64	49.59	48.07	45.61
Median score for group . .	142	139	134	136	137	138	135
Total cases . .	111	1858	41	3020	240	364	114

The table shows that the largest percentage of students with superior (B) and very superior (A) intelligence took

the classical, academic, and scientific courses. The college preparatory, commercial, and vocational courses contain the smallest percentage of seniors belonging to these superior groups. The *general* course contained the largest

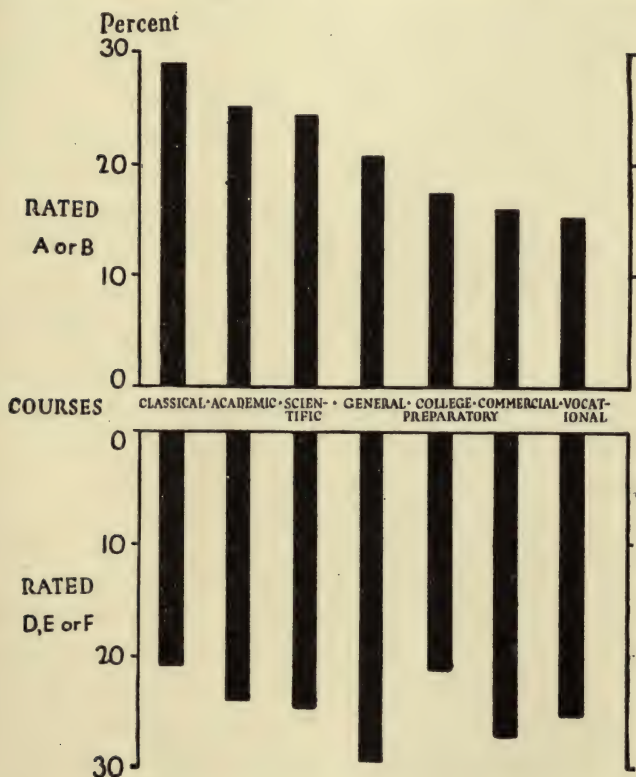


FIGURE 40. — Percentage of seniors completing each type of high school course who made an A or B and a D, E, or F intelligence rating on the tests.



percentage of seniors rated D, E, or F, with the commercial and vocational courses coming next. The college preparatory, commercial, and vocational courses contained the largest percentage of seniors possessing an average or C grade of ability. Where the per cent rated A or B is high and the per cent making scores above the state median low, as is the case with the classical group, it means that a large proportion of the group are rated C<sup>+</sup> or C. Most of these facts are shown in Figure 40, which indicates the per cent of seniors pursuing each course who made an A or B and a D, E, or F intelligence rating on our tests. As may readily be seen, there is a regular gradation downwards from the classical to the vocational course.

If we push our comparisons one step further to ascertain which courses are being taken by the seniors rated A<sup>+</sup> or A and E or F, we find that the brightest and dullest students are not found in the classical course-group, but in the academic or general courses. A special distribution table was prepared showing the percentage of students pursuing each type of course who possess each grade of ability from A<sup>+</sup> (approximately the highest 1 per cent of our standard group) to F (the intelligence rating for approximately the lowest 1 per cent of the total group). This comparison shows that there are proportionally more students with these very superior grades of ability among the seniors selecting the academic and scientific courses than among those selecting the classical or college preparatory courses. In fact, the proportion of "very superior" students in the vocational courses is about as high as it is in the classical course. (See Table XXII.)

TABLE XXII

PERCENTAGE OF STUDENTS RATED A<sup>+</sup> OR F WHO SELECTED EACH TYPE OF HIGH SCHOOL COURSE

PER CENT RATED	ACA- DEMIC	SCIEN- TIFIC	GEN- ERAL	CLASSI- CAL	VOCAL- TIONAL	COM- MERCIAL	COL- LEGE PREPAR- ATORY	CASES
A <sup>+</sup> . . .	2.90	2.44	1.99	1.80	1.75	.82	.42	123
F . . .	.86	.00	1.69	.00	.87	.27	.00	69
A . . .	6.73	4.88	5.46	8.10	4.39	4.39	3.33	330
E <sup>-</sup> . . .	4.20	4.88	6.06	1.80	5.26	3.85	2.08	280

3. Number of students pursuing different courses who score at the various intelligence levels. That the commercial and vocational courses contained proportionately more seniors possessing average intelligence and fewer from the higher levels and correspondingly more from the lower levels of intelligence is graphically shown by the frequency curves in Figures 41 and 42, which show the per cent of seniors pursuing various types of high school courses who possess each grade of intelligence from A<sup>+</sup> to F. A mere glance at these curves will show that for all the higher grades of mental ability the curves for the students pursuing the classical, academic, and scientific courses pass above the curves for the vocational and commercial groups, but for all the lower grades of ability the curves for the commercial and vocational groups rise above the other curves.

4. High school courses pursued by the students whom the school had accelerated or retarded. As shown in Chapter V the seniors who were promoted more rapidly than normally by the school rated higher on the

mental tests than did those who were retarded or only normally advanced. We were, therefore, interested to know what courses had been selected by the seniors whom the schools had accelerated, retarded, or normally promoted.

Figure 40 shows that a larger percentage of students graduating from the classical, academic, and scientific

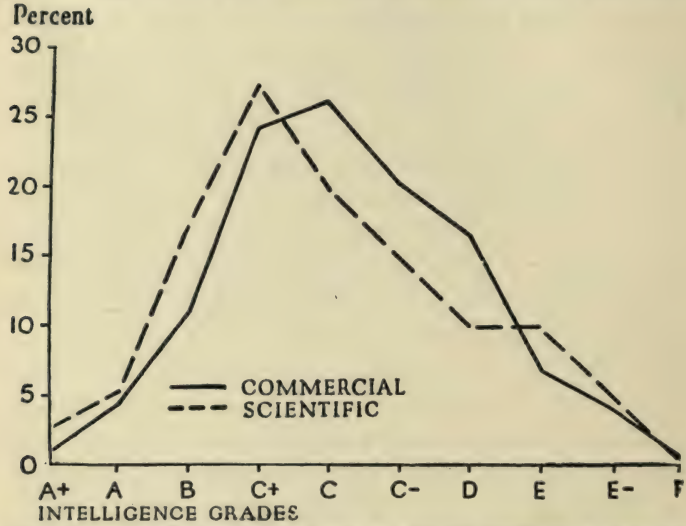


FIGURE 41. — Frequency curves for all seniors pursuing a commercial and scientific course in high school, showing the percentage belonging to each group who possess each grade of intelligence from A+ to F.

courses were rated A or B on the intelligence tests than were found among the groups who selected any of the other four courses. In other words, the seniors graduating from the college preparatory, commercial, and vocational courses contain the smallest percentage of students rated A or B, while the seniors graduating from the general course

make records which place them about midway between these other groups. We therefore divided our seniors into three groups: (1) the graduates from the classical, scientific, and academic courses because they ranked highest in intelligence; (2) the graduates from the commercial, col-

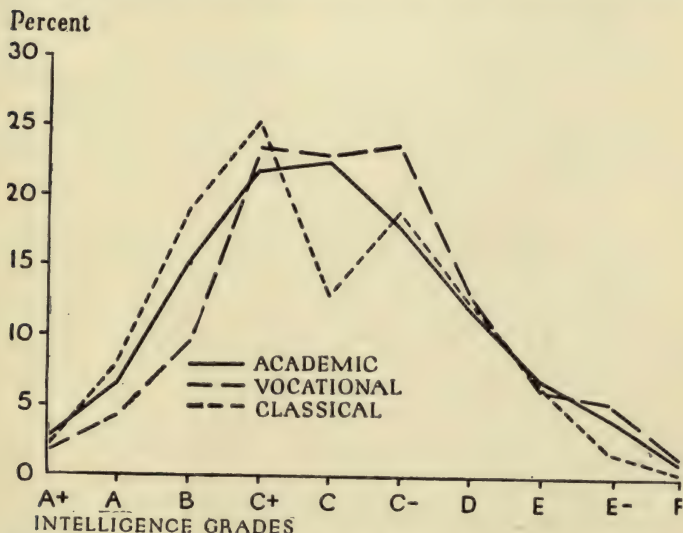


FIGURE 42. — Frequency curves for all seniors completing a vocational, academic, or classical course, showing percentage belonging to each course-group who possess the various grades of intelligence found among the high school seniors of the state.

lege preparatory, and vocational courses because they ranked lowest in intelligence; and (3) the graduates from the general course because they made an intelligence rating which placed them midway between the other two groups. We next distributed these seniors with reference to age at graduation in order to discover which course-groups had



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been accelerated, retarded, or normally promoted by the school to the greatest degree.

Table XXIII gives this information and shows that the courses containing the largest proportion of students with superior intelligence (the classical, academic, and scientific) have also the highest percentage of seniors accelerated, or graduating at the ages of 15, 16, or 17; and that the vocational, commercial, and college preparatory courses contain the smallest percentage of students accelerated by the school. This is especially true for the boys.

TABLE XXIII

PER CENT OF GRADUATES FROM DIFFERENT COURSES WHO WERE ACCELERATED, RETARDED, OR NORMAL IN SCHOOL STANDING

AGE GROUPS	ACCELERATED 15, 16, 17			NOR- MAL 18	RETARDED 19, 20, 21-27		
<i>Boys</i>							
<i>Per cent graduating from:</i>							
Classical, academic, and scientific courses . . . . .	54	53	43	34	34	34	24
General course . . . . .	38	40	49	55	54	62	59
College preparatory, commercial, and vocational courses . . . .	8	7	8	11	12	4	17
<i>Girls</i>							
Classical, academic, and scientific courses . . . . .	69	35	34	30	35	30	30
General course . . . . .	19	44	53	54	48	61	54
College preparatory, commercial, and vocational courses . . . .	12	17	13	16	17	9	16

On the other hand, if we examine the figures for the retarded groups, those graduating at the ages of 19, 20, or

21-27, we notice a marked *increase* in the percentage of seniors belonging to these age-groups graduating from the general, vocational, commercial, or college preparatory courses, and a *decrease* in the percentage of students graduating from the academic, classical, and scientific courses, showing that the latter courses contain a larger proportion of seniors who had been accelerated, and the former a larger percentage of students who had been retarded by the school.

This is still more clearly brought out if we compare the percentage of students graduating from the academic and general courses, shown in Table XXIV.

TABLE XXIV

PER CENT GRADUATING AT DIFFERENT AGES COMPLETING ACADEMIC AND GENERAL COURSES (SEXES COMBINED)

HIGH SCHOOL COURSES COMPARED	AGE AT TIME OF GRADUATION						
	Accelerated 15, 16, 17			Normal 18	Retarded 19, 20, 21-27		
Academic . . . . .	51	41	35	29	33	30	26
General . . . . .	28	42	51	55	51	61	56

**5. High school courses sending most students to college.** A question of considerable importance is the effect which the choice of a high school course has upon a student's college intention and his choice of a vocation in life. Table XXV shows the percentage of boys and girls completing each type of course who stated positively that they were going to college. The table shows that the scientific,

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college preparatory, and classical courses send a greater percentage of their students to college than the general, academic, commercial, or vocational courses. The scientific course ranks highest in this respect; the commercial and vocational courses lowest.

TABLE XXV

PER CENT GRADUATING FROM EACH TYPE OF HIGH SCHOOL COURSE GOING TO COLLEGE

COURSES	CLAS- SICAL	ACA- DEMIC	SCIEN- TIFIC	GEN- ERAL	COL- LEGE PRE- PARA- TORY	COM- MER- CIAL	VOCA- TIONAL
Boys . . . . .	70	79	93	75	81	40	52
Girls . . . . .	70	46	73	61	55	25	46

6. Effect of high school course on choice of college and selection of a college course. Another question of considerable importance was suggested by our comparative study of the occupations chosen, the high school subjects preferred, and the kind of college selected by our total group of seniors. To what extent had these young people been preparing in high school and how definitely are they looking forward to collegiate work which will prepare them for the occupations chosen? Table XXVI shows the percentage completing each type of high school course who stated that they were going to a liberal arts college, or to a professional or technical school, and also the percentage who had not selected the college they expected to attend.

TABLE XXVI

COLLEGE INTENTION OF STUDENTS COMPLETING EACH TYPE OF HIGH SCHOOL COURSE

PERCENTAGE OF TOTAL COURSE- GROUP	VARIOUS COURSE GROUPS						
	Classi- cal B. G.	Aca- demic B. G.	Scien- tific B. G.	Gen- eral B. G.	College Prepar- atory B. G.	Com- mercial B. G.	Voca- tional B. G.
Going to liberal arts colleges	32 57	16 50	11 63	17 63	33 87	50 55	14 53
Going to techni- cal colleges .	50 6	56 2	75 12	49 3	61 4	25 3	71 14
Undecided. No college selected . . .	18 37	28 48	14 23	34 34	6 9	25 42	15 33

While these facts are not conclusive, they show pretty clearly that most of the boys pursuing a scientific, vocational, and college preparatory course in high school, who plan to go to college, expect to attend a technical school. What is still more suggestive is the fact that boys graduating from the classical, academic, and general courses are going to technical colleges rather than to colleges of liberal arts. But the most significant fact is the large percentage of boys graduating from the scientific and vocational courses who have selected a technical college and the large percentage of those graduating from a general course who have not decided what college they will attend.

Most of the girls have selected a college of liberal arts, as we might expect. The girls are naturally more unsettled vocationally than the boys. The students graduating from the college preparatory, scientific, and classi-



cal courses seem to be more firmly decided upon what they are going to do, *i.e.* more students in these groups have decided definitely what college they will attend. The largest percentage of boys going to liberal arts colleges have graduated from the commercial, college preparatory, or classical courses. The largest percentage of girls going to liberal arts colleges graduated from a college preparatory, general, scientific, or classical course.

**7. General summary of the findings.** Summarizing briefly the facts revealed by the various comparisons made in this chapter, we may say :

1. That the classical, academic, and scientific courses, if taken as a whole, attracted the ablest students graduating from the high schools of the state last year, that the group of students completing a vocational course rank lowest on the intelligence tests, and that the students electing a general and college preparatory or commercial course rank somewhere between these other groups. This is true whether we compare these various course-groups on the basis of central tendency — the general level of intelligence possessed by the group — or on the basis of the percentage belonging to the group who make the highest intelligence scores made by any high school seniors.

2. The brightest seniors in the state, *i.e.* those making an intelligence rating of A<sup>+</sup>, were completing an academic course. A few individuals ranking in this highest 1 percentile group for all high school seniors were found in the commercial, vocational, and general courses. None in this most superior group was taking a classical or college preparatory course.

3. The dullest seniors were found in the general course.

4. The courses showing the widest range in intelligence were the academic, general, and commercial. The seniors completing scientific, classical, college preparatory, and vocational courses were much more evenly matched in mental strength, *i.e.* they were bunched more about the median. These latter course-groups, taken as a whole, might then rank higher or lower than our standard group. The scientific and classical course-groups rank higher and the college preparatory and vocational courses, lower.

5. The courses which contained the largest percentage of students accelerated and the smallest number retarded by the school were the classical, academic, and scientific. They also contained the largest percentage of students with high average, superior, and very superior intelligence. The general, vocational, commercial, and college preparatory courses, on the other hand, contained the largest percentage of students who had been retarded at some time during their high school course and the smallest percentage who had been accelerated by the school. They also contained the smallest proportion of students possessing the higher grades of intelligence and a larger percentage possessing the lowest grades of intelligence.

6. The scientific, college preparatory, and classical courses send the largest percentage of their students to college; the commercial and vocational courses the smallest. The scientific course ranks highest in this regard, the commercial course ranks lowest.

7. Most of the boys pursuing a scientific, vocational, or college preparatory course and going to college expect to

attend a technical college. What is still more suggestive is the fact that boys graduating from a classical or academic course also choose a professional and technical college more frequently than a college of liberal arts. A very large percentage of those graduating from the general course are undecided in regard to the college they will attend.

8. Most girls select a college of liberal arts. The largest percentage of boys going to liberal arts colleges graduated from a commercial, college preparatory, or classical course. The courses sending the largest percentage of girls to liberal arts colleges are the college preparatory, general, scientific, and classical.

It is, therefore, not so much the course taken in high school that determines the occupation and kind of college chosen by high school seniors as it is some particular study in that course which appeals specially to their capacities and interests. This will be brought out more clearly in the next chapter.

## CHAPTER IX

### INTELLIGENCE OF SENIORS PREFERRING DIFFERENT HIGH SCHOOL SUBJECTS

SINCE the intelligence tests were given near the close of the senior year, after the students had practically finished their high school course, an opportunity was provided to ascertain each student's favorite study and to compare the intelligence scores of those selecting different high school subjects. To this end each senior was asked to name the subject in his entire high school course which he preferred or enjoyed most. Our tabulations were then made in such a way that the intelligence scores made by the groups selecting different high school subjects could be compared with each other and with our state standard. The results which follow are from the same group of 5748 seniors whose records have been used in previous comparisons. All of this number except 191 gave full information on this point.

The subjects chosen by these seniors as favorite studies were classified as follows: (1) *Modern language*, including German, French, and Spanish; (2) *Latin*; (3) *Mathematics*, algebra, geometry, and trigonometry; (4) *General science*, including zoölogy, physical geography, and physiology; (5) *Physics*; (6) *Chemistry*; (7) *History and civics*, including ancient, European, and American history; (8) *English and literature*; (9) *Commercial subjects*,



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including bookkeeping, typewriting, and stenography; (10) *Manual training*, including mechanical drawing and all vocational shop courses; (11) *Agriculture*, including all special vocational subjects in this field; (12) *Domestic science*, including all subjects dealing with the art and science of homemaking; (13) *Music and art*, including painting, free-hand drawing, etc.; (14) *Debating*; and (15) *Gymnastics*, or physical training. Table XXVII shows the number of seniors (sexes combined) who selected each of these subjects as their favorite study.

TABLE XXVII

NUMBER OF STUDENTS SELECTING DIFFERENT HIGH SCHOOL SUBJECTS AS THEIR FAVORITE STUDY

FAVORITE SUBJECTS	CASES	PER CENT OF TOTAL GROUP	FAVORITE SUBJECTS	CASES	PER CENT OF TOTAL GROUP
Mathematics .	1156	20	Latin . . .	196	3
English and lit.	1119	19	Manual train.	147	3
History . . .	683	12	Chemistry .	144	3
Commercial .	561	10	Music and art	143	3
Science . . .	368	6	Agriculture .	87	2
Physics . . .	323	6	Botany . .	53	.92
Dom. science .	292	5	Debating . .	44	.77
Language . .	240	4	No sub. select.	192	3

1. General level of intelligence of seniors selecting different studies. The records made by the middle 50 per cent of the students belonging to these various groups are graphically shown in Figure 43. The horizontal bars show the record made by the middle 50 per cent preferring different subjects. The vertical cross-

bars indicate the median score for each group. Both may be easily compared with the state standard shown at the top of the figure.

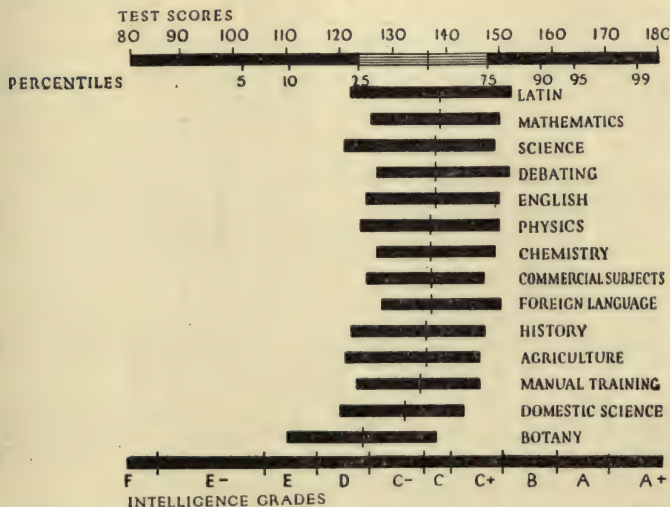


FIGURE 43. — Scores made by the middle 50 per cent of seniors selecting different high school subjects as their favorite study.

From this figure it may be seen that the seniors electing various foreign language and science subjects rank ahead of all other groups, that those electing vocational subjects rank lowest, and that those electing history and English stand about midway between the other groups. These relative rankings are more clearly shown if we compare the various favorite-study groups on the basis of the percentage belonging to each group who make scores in the mental test above the median for our total or standard group. The results of this comparison are shown in Table XXVIII.

TABLE XXVIII

PERCENTAGE OF SENIORS ELECTING DIFFERENT HIGH SCHOOL SUBJECTS WHO MADE SCORES ABOVE THE STATE MEDIAN

Language . . . . .	59	Debating . . . . .	50
Chemistry . . . . .	57	History . . . . .	47
Latin . . . . .	55	Commercial . . . . .	45
Mathematics . . . . .	54	Manual training . . . . .	43
Science . . . . .	54	Domestic science . . . . .	38
Physics . . . . .	52	Agriculture . . . . .	33
English . . . . .	50	Botany . . . . .	28

If we combine all the language, all the science, and all the vocational subject-groups and make our comparisons, we get the results shown in Table XXIX.

TABLE XXIX

PERCENTAGE SELECTING DIFFERENT FAVORITE STUDIES WHO MADE SCORES ABOVE THE STATE MEDIAN

Language . . . . .	57	Vocational subjects . . . . .	42
Science . . . . .	54	Music and art . . . . .	42
English . . . . .	50	Botany . . . . .	28
History . . . . .	47		

**2. Studies preferred by the brightest and the dullest seniors.** Comparing the range of the intelligence scores made by the seniors belonging to the several favorite-subject groups we get practically the same results that are shown above.

The results of this comparison are given in Table XXX, which shows the percentage of seniors selecting each high school subject who made an intelligence rating of A or B on the tests. A mere glance at the table will show (1) that the groups selecting foreign language and science contain proportionally more students with very superior (A) and superior (B) grades of intelligence than any other

group; (2) that the groups selecting commercial and vocational subjects contain the smallest percentage of stu-

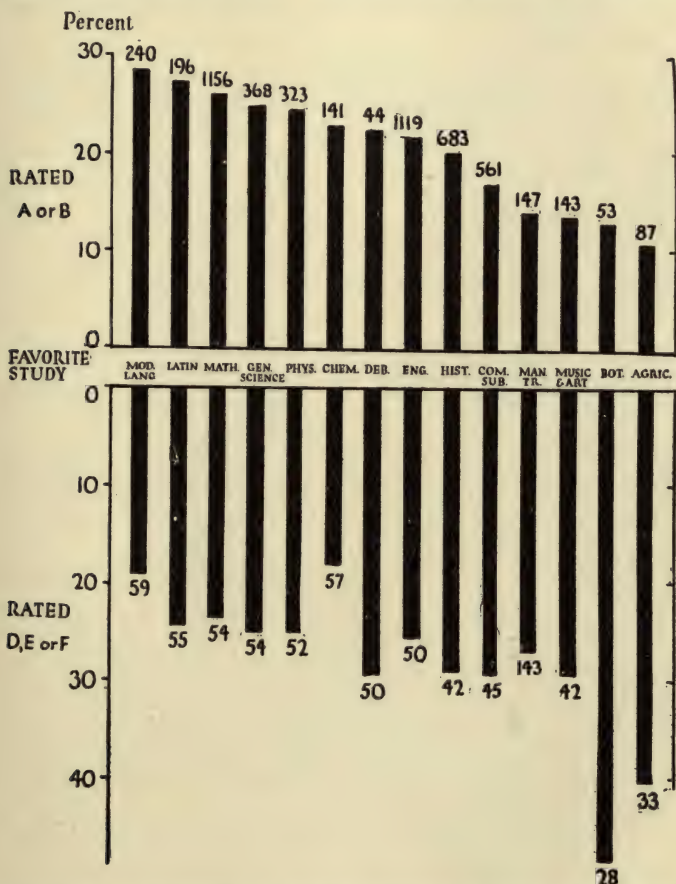


FIGURE 44. — Percentage of seniors preferring different studies who made the highest (A or B) and the lowest (D, E, or F) intelligence ratings on the tests.



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dents who make these intelligence ratings; and (3) that the groups electing history and English stand about midway between. These results are graphically shown in Figure 44.

TABLE XXX

PERCENTAGE OF STUDENTS PREFERRING DIFFERENT HIGH SCHOOL  
SUBJECTS RANKED A OR B

Language . . . . .	29	English . . . . .	22
Latin . . . . .	27	History . . . . .	20
Mathematics . . . . .	26	Commercial subjects . . . . .	18
Science . . . . .	24	Manual training . . . . .	14
Physics . . . . .	24	Botany . . . . .	13
Chemistry . . . . .	23	Domestic science . . . . .	12
Debating . . . . .	22	Agriculture . . . . .	11

Combining all language, all science, and all vocational subjects and ascertaining the number of seniors belonging to each group rated A or B, we get the following: in the group electing a foreign language, 28 per cent possess an A or B grade of intelligence; in the group electing mathematics or science, 26 per cent; in English, 22 per cent; in history, 20 per cent; in vocational subjects, 15 per cent.

If we push our comparison a step further and note the percentage preferring each high school subject who are rated A<sup>+</sup> or A, the difference in favor of the groups electing science and language as their favorite study in high school becomes still more marked, as may be seen by a comparison of the figures in Table XXXI.

The relative number of seniors possessing the highest grade of intelligence is almost seven times larger in the group electing a language than in the group electing a vocational subject, and five times as great in the group

electing a science as in the vocational group.<sup>1</sup> There are also fewer students selecting foreign language and science who make the lowest (E and F) ratings on the tests. (See Table XXXI.) It therefore appears that the students preferring the various foreign language and science subjects rank highest on the intelligence tests. The seniors choosing the various vocational subjects rank lowest. Those selecting English and history rank about midway between the other groups.

TABLE XXXI

PERCENTAGE OF SENIORS SELECTING VARIOUS FAVORITE SUBJECTS  
MAKING THE HIGHEST AND LOWEST INTELLIGENCE SCORES

VARIOUS FAVORITE SUBJECT GROUPS	PER CENT RATED A+ or A	PER CENT RATED F or E-	VARIOUS FAVORITE SUBJECT GROUPS	PER CENT RATED A+ or A	PER CENT RATED F or E-
Language	15	5	History	7	8
Latin	11	6	Commercial	5	4
Physics	11	8	Manual training	3	6
Science	10	8	Domestic science	2	9
Chemistry	10	6	Agriculture	3	16
Mathematics	9	5	Botany	2	15
English	8	5			

While this is true of the group taken as a whole it should be pointed out that a detailed study of the distribution and frequency tables for these several favorite-study groups revealed the following additional facts which seem significant :

<sup>1</sup>Some allowance must be made for the fact that our various groups were of unequal size, which makes these percentages more or less unreliable. But the differences shown seem to occur independently of this factor, because they occur where the number of cases are the same. The results are, therefore, significant.

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1. The brightest boys selected mathematics and science as their favorite study.

2. The brightest girls selected Latin and other foreign languages. The brightest boys never selected a language as their favorite study.

3. A few of the most superior girls selected English, music, art, or even commercial subjects.

4. The dullest seniors (both boys and girls) selected history and English.

5. Some students choosing mathematics and physics dropped very low on the tests, while the average for the group was relatively very high.

6. In the commercial and science subjects the boys are far superior to the girls. In the language groups the girls clearly outstrip the boys. In the groups selecting history and English the boys and girls are about equal in mental strength.

**3. Number of students in each favorite-subject group ranking at the various intelligence levels.** Frequency tables were prepared, showing the percentage of boys and girls selecting each high school subject who belonged to the various intelligence ranks. From these tables frequency curves were drawn, showing the proportion of boys and girls belonging to each favorite-subject group who possess each grade of intelligence. All these tables and curves cannot be given in this report, but Figure 45 permits comparison between the seniors selecting foreign language as their favorite study in high school and the group selecting botany. The figure shows the percentage belonging to each group who possess each grade of intelli-

gence from A<sup>+</sup> to F. The marked superiority of the students electing foreign language is shown by the rise of the language curve above the botany curve at all points indicating the higher grades of intelligence, and its rapid and regular descent below this curve at all points representing the lower grades of mental ability.

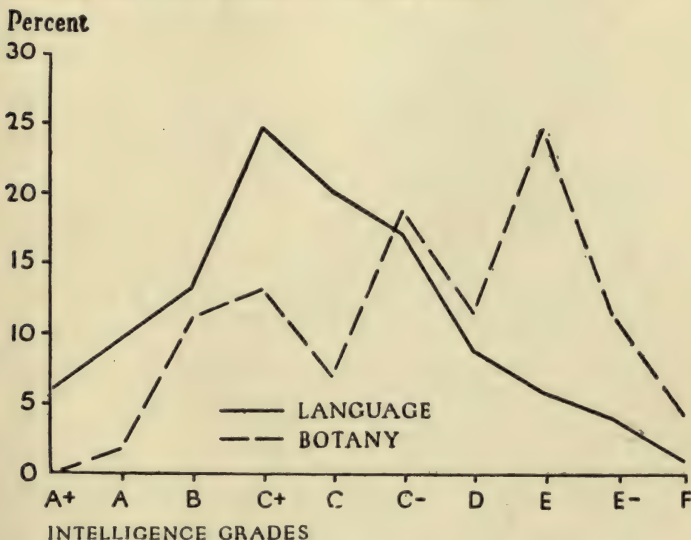


FIGURE 45. — Frequency curves for the seniors selecting botany and foreign language as their favorite high school study. They show the percentage belonging to each group who possess each grade of intelligence found among high school seniors.

The curves drawn on this basis for the various favorite-subject groups picture very clearly the superiority of the groups electing language, mathematics, and science over the groups choosing English, history, and the various vocational subjects. They also show in what this superiority



consists, bringing out many facts which cannot be presented in detail. For example, some subject-groups rank high in central tendency but possess few students of superior intelligence. Other groups contain a large proportion of individuals possessing only average ability, true especially for the groups selecting manual training, commercial subjects, music and art. Other subject-groups contain few or no students with the highest grades of ability, about the average number with average ability, and many with the lower grades of intelligence. This is true especially for the botany group. Some groups contain seniors with all grades of mental ability. For some of these groups the general level of the group was low (commercial-subjects group) and for others high (mathematics group).

**4. Sex differences.** As already indicated some important sex differences were revealed by the above comparisons. The brightest boys elected mathematics and science; the brightest girls, foreign language. The seniors selecting English, history, and the various vocational subjects showed little difference between the sexes, *i.e.* only the normal amount shown throughout the study.

Comparing the record made by the boys and girls electing the same favorite studies on the basis of central tendency, we get the results pictured in Figures 46 and 47. Figure 46 shows the record made by the boys and girls electing the same high school studies, and as in previous comparisons the horizontal bars indicate the record made by the middle 50 per cent of the group, which may be compared with our state standard shown at the top of the figure. The vertical cross-bars indicate the median score for the several groups.

Figure 47 shows the record made by the boys and girls electing (1) mathematics, physics, and chemistry;

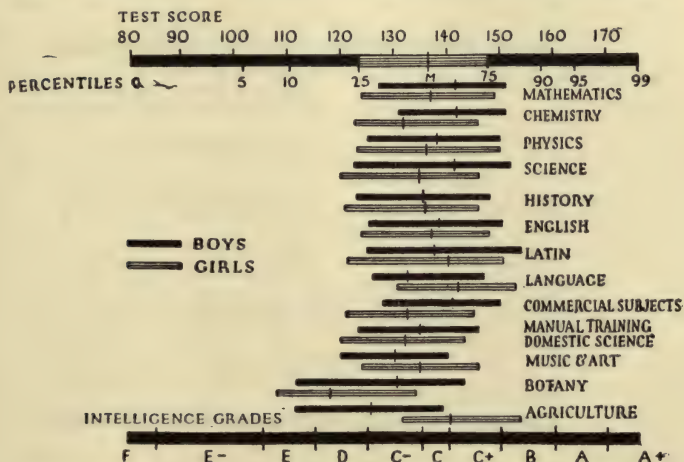


FIGURE 46. — Scores made by the middle 50 per cent of boys and girls choosing various high school subjects as their favorite study.

(2) general science; (3) all foreign languages; (4) all vocational subjects; (5) history and civics; and (6) English and literature. These comparisons bring out strikingly the marked superiority of the boys electing mathematics and science and the corresponding superiority of the girls electing foreign language subjects. For the groups choosing history, English, and various vocational studies the boys show about the same degree of superiority that has been found in the various comparisons made throughout the study.

The same trend is shown if we compare the percentage of boys and girls belonging to each favorite-study group

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who made scores above the state median. The results of this comparison are given in Table XXXII.

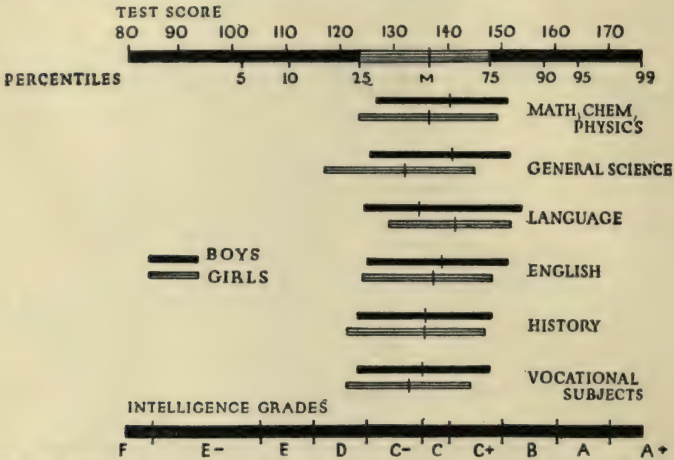


FIGURE 47.— Scores made by the middle 50 per cent of boys and girls preferring certain groups of high school subjects.

TABLE XXXII

PER CENT OF BOYS AND GIRLS SELECTING DIFFERENT FAVORITE STUDIES SCORING ABOVE THE STATE MEDIAN

BOYS		GIRLS	
Debating . . . . .	63	Debating . . . . .	—
Science . . . . .	60	Science . . . . .	45
Mathematics . . . . .	59	Mathematics . . . . .	50
Chemistry . . . . .	62	Chemistry . . . . .	41
Physics . . . . .	53	Physics . . . . .	48
Commercial . . . . .	50	Commercial . . . . .	40
Latin . . . . .	49	Latin . . . . .	57
Language . . . . .	37	Language . . . . .	57
History . . . . .	50	History . . . . .	45
English . . . . .	53	English . . . . .	50
Manual training . . . . .	44	Domestic science . . . . .	38
Botany . . . . .	38	Botany . . . . .	22
Agriculture . . . . .	26	Agriculture . . . . .	62

It should also be pointed out that these same sex differences appear if we compare these groups on the basis of range in intelligence scores. Table XXXIII shows the per cent of boys and girls electing different subjects who received the highest (A and B) mental rating on the tests. Figure 48 pictures these sex differences for representative subject-groups.

TABLE XXXIII

PER CENT OF BOYS AND GIRLS ELECTING DIFFERENT FAVORITE  
SUBJECTS RATED A OR B

Boys		Girls	
Debating . . . . .	38	Debating . . . . .	—
Latin . . . . .	36	Latin . . . . .	26
Mathematics . . . . .	28	Mathematics . . . . .	24
English . . . . .	28	English . . . . .	21
Chemistry . . . . .	26	Chemistry . . . . .	10
Commercial . . . . .	25	Commercial . . . . .	15
Physics . . . . .	24	Physics . . . . .	25
History . . . . .	21	History . . . . .	19
Language . . . . .	21	Language . . . . .	29
Manual training . . . . .	14	Domestic science . . . . .	11
Botany . . . . .	14	Botany . . . . .	13
Agriculture . . . . .	7	Agriculture . . . . .	29

In such studies as mathematics, science, chemistry, commercial subjects, language, and agriculture, there is a marked difference in the intelligence of the sexes choosing the same subject. For the agricultural and language groups the girls are ahead, and for the other subjects the boys make the best intelligence rating. The seniors electing, history, English, and the various vocational subjects are more uniform in mental strength. That is to say, the difference between the sexes here corresponds more closely to the degree of superiority that has been shown by the boys throughout this study.



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Figure 49 compares the boys and girls electing science as their favorite high school subject, on the basis of the per cent in the group possessing each grade of intelligence from A<sup>+</sup> to F. Similar curves were drawn for the group electing each high school subject. For some subjects, such as history, the curves for the sexes are practically parallel throughout their course. In other subjects the boys selecting the study rate distinctly higher than the

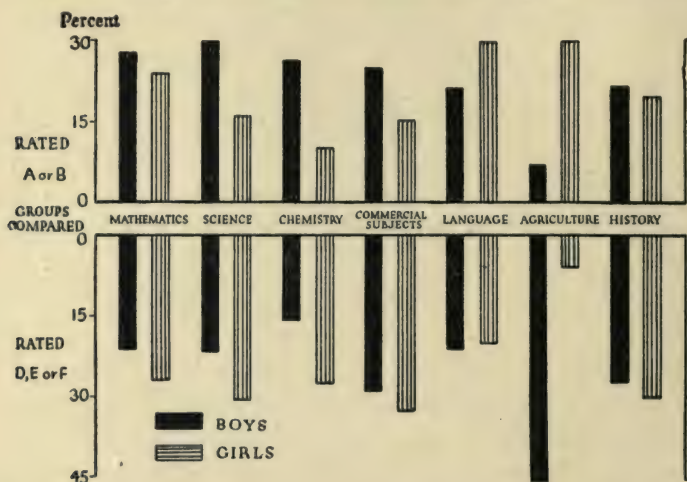


FIGURE 48.—Per cent of boys and girls preferring different high school studies who were rated A or B and D, E, or F on the tests.

girls at every level of ability. For some subject-groups, such as foreign language and agriculture, the girls rank consistently higher than the boys. For other subjects the curves are broken. In English, for example, the curve for the boys rises above the curve for the girls at the points indicating the higher (A and B) grades of ability. At the

points indicating all other grades of intelligence the curves run practically parallel, showing that this group has more boys of superior intelligence than girls, but contains just as large a proportion of boys as girls possessing average and the various grades of inferior mental ability.

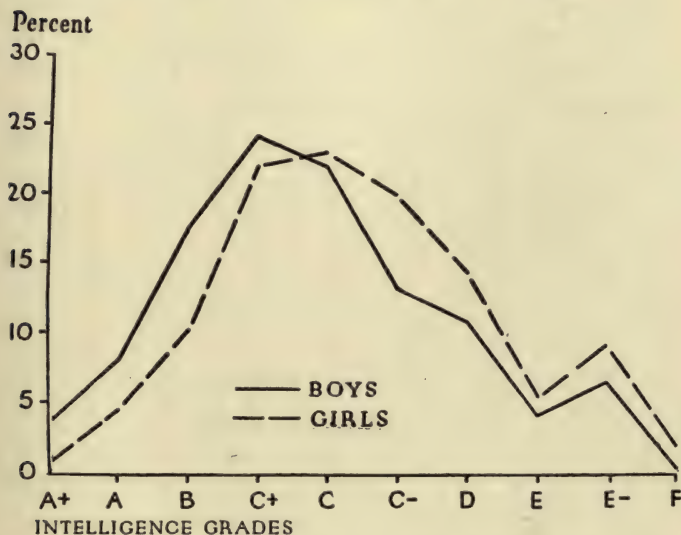


FIGURE 49. — Frequency curves for the boys and girls choosing science as their favorite high school study. They show the percentage of those who possess each grade of intelligence found among high school seniors.

The outstanding facts revealed by this comparison of the sexes are the following:

1. The brightest boys show a decided preference for mathematics and science; the brightest girls for foreign language.

2. More boys (26 per cent) prefer mathematics than any other subject, the largest percentage of girls (28 per cent) prefer English and literature.

3. More than half of the seniors taking the tests came from the rural districts of the state. Notwithstanding this fact, only 3 per cent of the boys selected agriculture as their favorite study in high school, and these made the lowest intelligence rating on the tests made by any seniors. Only 5 per cent of the girls selected domestic science as their favorite study, while more than 12 per cent of the girls selected commercial subjects. The results suggest that the high schools of the state are educating the boys and girls *away* from the home and farm.

4. The boys electing commercial subjects made relatively high intelligence ratings on the tests, while the girls selecting the same subjects made low ratings. This suggests that the boys are taking the commercial courses in preparation for business, while the girls take them in order to become stenographers. This is further indicated by the fact that 64 per cent of the boys selecting commercial subjects stated that they were going to college, as compared with only 22 per cent of the girls selecting the same subjects.

5. **Effect of favorite study upon the choice of an occupation.** We also desired to determine the effect of the favorite high school subject upon the choice of a vocation in life. The results of this comparison for the boys are given in Table XXXIV. It shows the per cent of boys selecting particular occupations who chose different high school subjects.

TABLE XXXIV

PERCENTAGE OF BOYS CHOOSING PARTICULAR OCCUPATIONS WHO  
SELECTED DIFFERENT FAVORITE STUDIES

FAVORITE STUDY	OCCUPATIONS											TOTAL CASES
	Engineer	Business	Physician	Lawyer	Teacher	Farmer	Journalist	Mechanic	Chemist	Scientist	Minister	
Math. . . .	37.3	24.2	10.4	11.8	39.4	25.9	—	24.2	21.7	25.0	18.8	373
History . .	6.1	14.9	16.7	45.6	25.4	14.2	12.5	22.9	6.5	12.5	18.8	204
Physics . .	23.2	6.2	15.6	11.5	7.1	12.6	—	8.5	17.4	—	6.3	192
Science . .	11.7	13.0	25.0	5.9	7.0	6.0	6.3	15.0	8.7	25.0	—	158
English . .	1.6	9.8	6.3	14.7	5.4	8.2	50.0	5.2	2.2	12.5	31.3	92
Vocational subjects .	6.7	1.9	1.0	1.5	2.8	5.7	6.3	11.1	—	—	—	80
Com'l . . .	2.3	21.7	5.2	2.9	1.4	4.4	—	5.2	—	12.5	6.3	76
Chemistry	7.3	3.1	13.5	.0	1.4	.9	—	2.6	41.3	12.5	18.8	80
Latin . . .	.9	2.5	5.2	5.9	5.6	2.2	12.5	2.6	2.2	—	—	35
Agri. and bot. . .	.5	1.9	1.0	0.0	4.2	18.6	6.3	2.6	—	—	—	73
Debating .	.2	0.0	0.0	10.3	0.0	.3	—	—	—	—	—	9
Music . .	—	.6	—	—	—	1.3	6.3	—	—	—	—	6
Total cases	426	161	96	68	71	317	16	153	46	8	16	1378

An inspection of this table shows that there is a close relation between the occupation selected and a student's favorite study. While there are some signs of aimless choosing, it will be noted that the subjects chosen prepare in the main for the life occupations selected. For example, the favorite studies of the majority of the 426 boys who had decided to become mechanical, electrical, civil, mining, and chemical engineers were mathematics, physics, and science; of the group who had decided upon a business career: mathematics, commercial subjects,



history, and science; for the physician group the favorite studies were science, history, physics, and chemistry; for the lawyer group: history, English, and debating; for the farmers: mathematics, agriculture, history, and physics; for the journalists: English, foreign language, and history; for the skilled mechanics: mathematics, history, and vocational subjects; for chemists: chemistry, mathematics, and physics; for scientists: science and mathematics; and for ministers: English, mathematics, history, and chemistry.

Our results show that the subjects to which the students are introduced in high school, especially those that appeal to their native capacities and interests, have a marked and determining influence upon their vocational choice. This argues strongly in favor of having considerable pre-vocational or try-out work in the early part of a boy's high school course.

**6. Influence of favorite study upon college intention.** We desired to know also what relation existed between the special interests that our seniors expressed in certain high school studies and their desire to go to college. Were the students preferring certain high school studies more likely to go to college than students preferring other subjects? What were the favorite studies of the students going to college in the largest numbers and of those who did not expect to attend?

Table XXXV suggests answers to these questions as follows:

1. The girls preferring foreign language, English, and history are going to college in the greatest numbers. Those

TABLE XXXV

PERCENTAGE OF BOYS AND GIRLS SELECTING DIFFERENT FAVORITE STUDIES WHO WILL ATTEND COLLEGE

FAVORITE STUDY IN HIGH SCHOOL	WILL ATTEND COLLEGE	WILL ATTEND		COLLEGE UNDE- CIDED	WILL NOT ATTEND COLLEGE	TOTAL CASES IN GROUP
		College Liberal Arts	Technical School			
			BOYS			
Debating . .	93	6	19	68	7	16
Latin . . . .	78	27	32	19	22	37
Science . . .	87	11	39	37	13	237
Mathematics	80	12	39	29	20	604
English . . .	81	33	17	31	19	149
Chemistry . .	84	10	62	12	16	115
Com'l subj. .	64	19	17	28	36	139
Physics . . .	77	7	49	21	23	299
History . . .	76	20	28	28	24	325
Language . .	79	16	32	31	21	19
Manual tr. .	66	6	28	32	34	147
Botany . . .	67	10	29	28	33	21
Music and art	75	35	10	30	25	20
Agriculture .	58	9	29	20	42	70
No favorite .	60	9	19	32	40	107
			GIRLS			
Agriculture .	36	24	—	12	64	17
Language . .	63	43	2	18	37	221
Latin . . . .	67	45	1	21	33	157
Physics . . .	75	42	—	33	25	24
Mathematics	61	39	1	21	39	552
English . . .	66	47	1	18	34	970
History . . .	67	50	1	16	33	359
Science . . .	57	37	7	13	43	131
Commercial .	22	10	1	11	78	423
Music and art	53	31	2	20	47	123
Gymnastics .	61	39	4	18	39	28
Dom. sci. .	53	31	4	18	47	292
Botany . . .	59	47	3	9	41	32
No favorite .	52	34	5	13	48	88

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electing domestic science, music and art, agriculture, and science are least likely to go.

2. The boys whose favorite subjects are mathematics, science, and language are going to college in greater numbers than those electing agriculture, manual training, botany, and commercial subjects.

3. The largest percentage of boys from practically every group have decided to go to a professional or technical school. Most of the girls are going to colleges of liberal arts.

4. The boys selecting mathematics, science, chemistry, physics, agriculture, and manual training are going to a technical or professional college in largest numbers. Many electing English, history, Latin, commercial subjects, music and art are going to colleges of liberal arts. The latter groups also contain the largest percentage of students who were undecided in regard to the college they expected to attend.

**7. General résumé of results.** 1. If the sexes are combined and the groups selecting different favorite subjects are considered as units, foreign language, mathematics, and science subjects are regularly preferred by the brightest seniors in the state. The vocational subjects are regularly chosen by the dullest. English and history occupy a position about midway between the language and science groups on the one hand and the vocational groups on the other. These conditions hold whether we make our comparisons on the basis of central tendency or on the basis of the percentage belonging to each group who make the highest mental rating on

the tests. Of those selecting language 57 per cent made scores above the state median; of those electing science, 55 per cent; English, 50 per cent; history, 47 per cent; vocational subjects, 42 per cent. Comparing these several groups on the basis of the range of intelligence possessed by the members of each group, we find that 28 per cent of those electing foreign language made an intelligence grade of A or B. Of those electing science or mathematics 26 per cent were rated A or B; English, 22 per cent; history, 20 per cent; vocational subjects, 15 per cent. If we compare those rated A<sup>+</sup> or A, we find that about seven times as many students electing language or science belong to these superior intelligence groups as were found among the groups electing vocational subjects.

2. The students making the highest intelligence scores (chiefly boys) selected mathematics and science as their favorite study in high school. The most superior boys never selected a language as their favorite study. The brightest girls selected a foreign language as their favorite study in high school.

3. A few of the brightest seniors in the state selected English, music, or art (girls), and manual training and commercial subjects (boys).

4. Taken as a whole, comparatively few seniors selected foreign language as their favorite study — less than 3 per cent of the boys (2.51 per cent) and only about 11 per cent of the girls (10.98 per cent). More boys preferred mathematics (26 per cent) than any other subject. The largest percentage of girls selected English as their favorite study in high school.



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5. Few boys (3 per cent) selected agriculture and only 5 per cent of the girls selected domestic science, while 12.29 per cent selected commercial subjects. More than half of our seniors came from the rural and agricultural districts of the state.

6. There is a marked difference in the mental strength of the boys and girls selecting the same favorite subject. The boys selecting mathematics, chemistry, commercial subjects, and general science are far superior in general intelligence to the girls selecting the same subjects. In the foreign language and agricultural groups the girls are superior to the boys. The boys and girls selecting history, English, and the various vocational subjects are about equal in mental strength.

7. That a senior's favorite high school study has some effect in determining his choice of a vocation is shown by the fact that the subjects chosen as favorite studies prepare more or less directly for the occupations selected. This points to the importance of introducing high school students to a rather varied field of work in the early part of their high school course in order to ascertain their vocational capacities and interests.

8. Because of the influence of the favorite study on vocational choice and its relation to the type of work done in college, the student's favorite study in high school seems to influence his college intention and his selection of a college course. The girls who prefer language, English, and history are going to college in the greatest numbers and they are going to colleges of liberal arts. Those electing domestic science, music and art, agriculture, and

general science are least likely to go to college. The boys whose favorite subjects are mathematics, science, and foreign language are going to college in greater numbers than those electing agriculture, manual training, botany, and commercial subjects. The former also select professional or technical schools. Most of the boys going to colleges of liberal arts select English, history, Latin, commercial subjects, music and art. These favorite-subject groups also contain most of the boys who had not decided what college they would attend.

**8. Discussion of results.** Some of the educational implications of these facts should be briefly pointed out. The fact that the brightest students select mathematics, science, or language as their favorite studies and that students selecting vocational subjects rank lowest in the mental tests may be interpreted in a number of ways. It may mean that the brightest and most ambitious students in high school have been directed by parents and teachers into the courses which feature these traditional subjects. In other words, it is fashionable for the best students to take the academic, classical, or scientific courses, while the duller students may naturally drift into a vocational course; or they may try the academic courses without success and be forced into the others. It may also be true that the brighter students are more consistently bent upon going into the professions, because of their home environment, or the advice of their associates, and so are urged to take a course in high school which gives the traditional preparation for these so-called learned professions and for a college course.

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The fact that students are going to our high schools and colleges in ever increasing numbers and that a senior's choice of a favorite study in high school seems to have such a marked influence upon his choice of an occupation and his college intention, may well make us question whether the high school, as it is now organized and conducted, adequately meets the vocational inclinations and needs of all of its students.

The fact that the brightest seniors in the state were boys, that these brightest boys select mathematics and science as their favorite study in high school, and that a larger percentage of boys select mathematics than any other study, while the brightest girls select foreign language as their favorite study (five times as many girls selecting foreign language as boys), and that the largest percentage of girls select English and literature as their favorite study—all point in the direction of fundamental sex differences that are doubtless significant. If taken in conjunction with the facts revealed in Chapter V showing the grades of intelligence possessed by the seniors which the school actually accelerates and retards, it points clearly to the need for a better adaptation of the instruction of the high school to the interests, mental capacities, and needs of the boys. There is much evidence in this study that the high schools do not meet the needs of the boys as well as the needs of the girls. This may help to explain why the girls attend them in ever increasing numbers and outstrip the boys in application to the work and in securing successful school marks.

The fact that the various subjects which the student

studies in high school, particularly the study which he most enjoys, has so much to do with his choice of an occupation and helps to determine whether or not he will go to college as well as his selection of a college points pretty conclusively either to a need for prevocational work in the early part of the high school course, or to a change in the nature of the work given, so that each student would be able to "find himself," as it were vocationally, by coming into contact with several representative lines of work. When considered in connection with the facts revealed in Chapter VII, which show how few lines of work were chosen by this large group of high school seniors, we must conclude that if our facts have any significance at all they mean that the high schools are not adequately meeting the needs of the heterogeneous group of young people who now attend them. They are unintentionally piloting these young people towards a few lines of work and are not providing the means either to help them *find* the work in life for which they have special mental capacity, or to *prepare* for it.

It is also significant that only 3 per cent of the boys elected agriculture as their favorite study in high school and only 5 per cent of the girls selected domestic science, while more than 12 per cent of the girls selected commercial subjects. When we consider that more than half of our total group of seniors come from the rural and agricultural districts of the state these facts seem particularly significant and should at least make us raise the question whether the high schools as now organized and conducted are not in fact educating our boys and girls away from



the home and farm instead of preparing them on a high plane for these important kinds of work. We should ask whether the courses of study in the rural high schools of the state contain what these pupils really need and should be taught.

The results of this section give a new social significance to the high school curriculum and indicate the direction in which we must look to make the needed readjustments.

## CHAPTER X

### INTELLIGENCE OF HIGH SCHOOL SENIORS REPRESENTING DIFFERENT OCCUPATIONAL CLASSES

IN most civilized countries various types of secondary schools have developed to meet the needs of different social and occupational classes. The English public school, the Lycée of France, and the Gymnasium, Real-Gymnasium, and Real-Schule in Germany are examples. In America a single system of public schools, extending from the kindergarten and elementary schools through the high school to the state university, has been developed for our entire population. Social and economic barriers have been broken down. The American high school is, in theory at least, the people's school, organized and conducted to meet the needs of all social and occupational classes. This being the case, we desired to discover (1) whether all occupational and economic classes were actually represented in the graduating classes of Indiana high schools; (2) whether the number of seniors belonging to each occupational class was about in the proportion that the relative size of the various occupational groups in the state would lead us to expect; in other words, whether each occupational group had its full quota of students in the high school or whether the high schools were being patronized more by certain occupational or

social classes than by others; (3) whether there are any inequalities in intelligence between the seniors coming from these several occupational and economic classes.

In order to obtain the facts needed to make such comparisons each senior was asked to give his father's occupation and annual salary. In case either of these items could not be accurately specified by the pupil, the information was obtained and recorded by the teacher giving the examination, and this fact noted in her final report to us. In every case the teacher or principal giving the examination was asked to verify these items. Tabulations were then made in such a way that the intelligence scores made by the seniors coming from each occupational class might be compared with one another and with the state standard. The intelligence scores of the students belonging to various economic groups were also determined and compared with each other and with our state standard. The results of this latter comparison will be presented in the following chapter.

**1. Occupational groups represented in the senior classes of Indiana high schools.** The occupations of parents reported by the seniors taking the tests were classified into the following seven groups:

1. *Professional*, including teachers, physicians and surgeons, musicians and teachers of music, clergymen, lawyers, judges, dentists, editors, civil and electrical engineers, architects, etc.

2. *Clerical workers*, including bookkeepers, cashiers, accountants, stenographers, typists, shipping clerks, secretaries, collectors, etc.

3. *Salesmen and clerks*, including clerks and salesmen in stores, retail dealers, commercial travelers, brokers and agents, deliverymen, lumber and coal yard employees, etc.

4. *Skilled artisans*, including all skilled workers in the various trades, such as carpenters, painters, plumbers, machinists, blacksmiths, stonecutters, bakers, typesetters, engravers, and jewelers.

5. *Business executives and foremen*, including all executives and managers in the various manufacturing and trade pursuits.

6. *Day laborers*, all semi-skilled laborers in the various manufacturing and trade pursuits, including farm laborers.

7. *Farmers*, all persons engaged in general farming, gardening, or stock raising on a productive or managerial basis.

**2. Number of high school seniors belonging to each occupational class.** Ninety-one per cent of all seniors taking the tests gave information sufficiently definite and accurate concerning the occupation of their father to be of use in the comparisons of this section. The loss of the 9 per cent was due to the fact that many whose fathers were dead merely mentioned this fact without naming his former occupation; others answered the question too vaguely for the results to be of value. A few teachers failed to verify or to supply the missing data on this point. The 5249 individuals who furnished reliable information concerning the occupation of their fathers were distributed among these various occupational groups as shown in Table XXXVI.



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TABLE XXXVI

NUMBER OF HIGH SCHOOL SENIORS BELONGING TO EACH OCCUPATIONAL CLASS

OCCUPATIONS REPRESENTED IN HIGH SCHOOL	PROFESSIONAL	CLERICAL	SALESMEN	ARTISANS	EXECUTIVES	LABORERS	FARMERS
Total cases reporting . . . . .	317	211	325	946	998	489	1963
Per cent . . . . .	6.04	4.82	6.19	18.02	19.01	9.32	37.40
Per cent of total workers in state belonging to each occupational class	5.78	3.70	5.11	19.04	9.49	23.77	33.20

The table shows the percentage of the total population of the state engaged in remunerative or productive work who belong to these several occupational groups.<sup>1</sup>

From a comparison of the figures presented in this table it will be seen that the percentage of seniors whose parents belong to each of these occupational groups corresponds roughly to the number of persons actually engaged in these occupations in the state for the following occupational groups: professional, clerical workers, salesmen and clerks, and artisans. The business executive group is twice as large as we should expect. The day laborer group had only about one-third its normal quota of students in last year's senior classes. Aside from these two occupational groups the parallel is rather close, suggesting that Indiana high schools are succeeding very largely in their democratic appeal to all social and oc-

<sup>1</sup> Figures for obtaining the per cent of workers in the state who belong to the various occupational groups represented in the high school were computed from the U. S. Census report for 1910.

cupational groups represented in the state. The children from all classes do attend the high schools of the state and do graduate, but not in the right proportions. Parents belonging to the professional, clerical, and salesmen groups seem to have about their proper quota of graduates. Farmers and business executives seem to have more than their quota. The skilled artisan and day laborer groups seem to have less than their normal quota.

**3. Intelligence of seniors belonging to each occupational class.** But a matter of greater interest and importance than the proportion of seniors belonging to each occupational group is the general level of intelligence of the seniors coming from these different occupational classes. It has been assumed by many economists that there is a direct relation between the native mental endowment of individuals and their occupational or economic status in the community; that different occupational classes represent, in a sense, fundamental differences in native mental ability which in diverse ways have determined their occupational selection and economic status.<sup>1</sup> In fact so deep rooted is this belief that one of the criteria used by social workers for detecting feeble-mindedness in an individual is his economic status and occupational success.

We wished, therefore, to determine (1) the general level of intelligence of the seniors coming from each occupational group; (2) the range of intelligence or grades of native mental ability which each of these groups actually possessed; and (3) the relative frequency within each

<sup>1</sup> Compare on this point Army Mental Tests, Washington, D. C., November 22, 1918, p. 23.

group of the various grades of intelligence found among high school seniors. If, for example, it should be found that each occupational group had about the same percentage of students making the highest intelligence scores obtained by high school seniors, this fact would have far-reaching social and educational significance. If, on the other hand, our results should show marked differences between the general levels of mental ability possessed by different occupational groups, this fact would be theoretically and practically significant.

(a) *General level of intelligence of the seniors representing different occupational classes.* The mental tests given in the army revealed great differences between the scores made by the men belonging to different occupational groups. Of the 36,500 cases grouped by occupations in a recently published report, the farmers and day laborers ranked very low on the mental tests. The medical and engineering officers, stenographers, and ministers, on the other hand, ranked high.

In a study from the Psychological Laboratory of Indiana University, wide divergences were found between the intelligence scores made by children whose fathers belonged to different occupational classes.<sup>1</sup> Children whose parents belong to the professional class make much higher scores on the intelligence tests than do the children of parents belonging to the artisan or day laborer classes. The percentages of children representing various occupations who made scores above the median for the total group tested

<sup>1</sup>S. L. Pressey and Ruth Ralston, "The Relation of Occupation to Intelligence as It Appears in the School Children of a Community," *Journal of Applied Psychology*, December, 1919, pp. 368-374.

were as follows: professional 85, business and industrial executives 68, skilled tradesmen 41, day laborers 39. These figures were obtained from all children 10 to 14 years of age in a community where school attendance was compulsory. The results should, therefore, be more reliably indicative of the real differences which exist between these various occupational groups than the results we obtained from high school seniors, because children from certain occupational classes may not attend high school at all, and children from other occupational groups might not be able to graduate from high school if they did attend. The results of the study referred to, cannot, however, be taken as truly representative since they were obtained from children in a single community which, being the seat of the state university, was overweighted with representatives of the professional class. The results are, nevertheless, significant and should be considered in connection with the data gathered in the army, and the results obtained in the present study of the intelligence of 6188 high school seniors from all parts of the state, and representing all the occupational groups listed above.

As previously stated all seniors taking the test were regrouped on the basis of the occupations of their fathers. The intelligence scores made by these various occupational groups were then compared on the basis of central tendency. The results are shown in Figure 50, which indicates the record made by the middle 50 per cent of the seniors belonging to each occupational class. The data are so presented that the record made by any occupational group may readily be compared with the state standard or with



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the record of any other occupational group. As may readily be seen, there are marked differences between the general level of mental ability among these several occupational groups. The children from professional families rank ahead of all other groups. The children of day laborers and farmers rank lowest and this order remains the same whether the sexes are considered singly, or together.

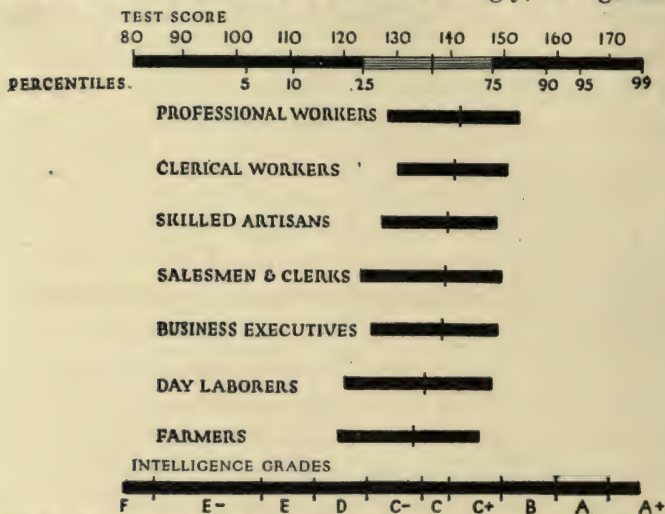


FIGURE 50. — Scores made by the middle 50 per cent of seniors representing different occupational classes.

Table XXXVII shows the per cent belonging to each occupational class who made scores above the median of our standard group. In this comparison the groups occupy the same relative positions shown above except that salesmen and clerks rank ahead of the artisan class. Perhaps the most significant fact revealed by the latter comparison is the notable sex differences which appear when

we consider the professional and artisan groups. (Compare section 4 below.)

TABLE XXXVII  
PER CENT OF SENIORS BELONGING TO EACH OCCUPATIONAL CLASS  
MAKING SCORES ABOVE THE STATE MEDIAN

OCCUPATIONAL CLASSES	PROFESSIONAL	CLERICAL	SALESMEN	ARTISANS	EXECUTIVES	DAY LABORERS	FARMERS	No OCCUPATION MENTIONED
Sexes								
comb'd	60	60	56	55	54	47	43	50
Boys . .	67	65	60	60	59	50	44	58
Girls . .	54	57	55	51	50	46	42	47
Cases . .	317	211	325	946	998	489	1963	499

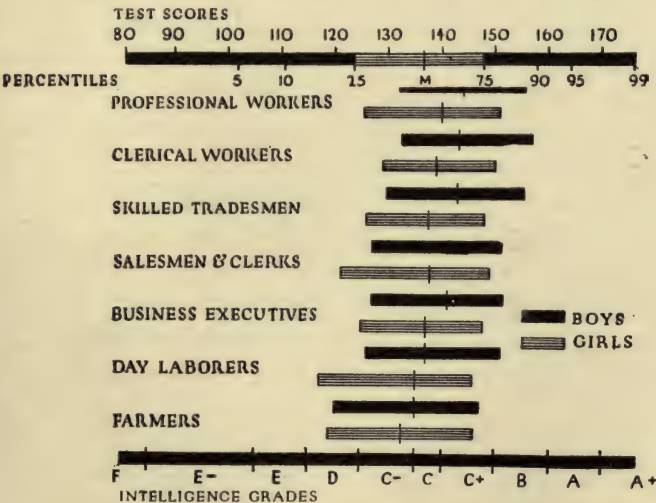


FIGURE 51. — Same groups of seniors compared in Figure 50 distributed according to sex.

That these differences between occupational groups and between the sexes hold for all levels of ability is shown by the percentile curves pictured in Figure 52, which compare the records made by the professional and farmer groups. The curves show the scores made by a definite proportion of students belonging to each occupational class, the 5, 10, 20...95 percentile groups. An inspection of the figure reveals the fact that the boys rank consistently higher than the girls at every level and that the superiority of both boys and girls coming from the professional class is clearly marked. Similar curves were drawn for all occupational groups but no additional facts were revealed. Sex differences similar to those shown in Table XXXVII and in Figures 51 and 52 appear in each group. The significant fact revealed by these curves is that the superiority or inferiority of a given group remains constant for all intellectual levels.

These results appear all the more noteworthy when we reflect that the day laborer group had less than half its normal quota of students in the graduating class.

(b) *Distribution of the brightest and dullest seniors among the various occupational groups.* A question of greater sociological and educational importance than the foregoing is that of the presence or absence, in each occupational group, of seniors possessing the most superior grades of mental ability. In which occupational groups were the brightest individuals actually found? What occupational classes contributed most seniors making the highest and lowest mental ratings on our tests? To answer these questions the several groups

were compared with reference to the number of seniors belonging to each group whose mental test score gave them mental ratings of A<sup>+</sup>, the highest, and F, the lowest, intelligence grades made by high school seniors.

Since the day laborer class had less than half its normal quota in the senior classes of the high schools tested, we would expect the representatives of this occupation to rank higher as a group than the other occupational classes, on the theory that those remaining to graduate would be a

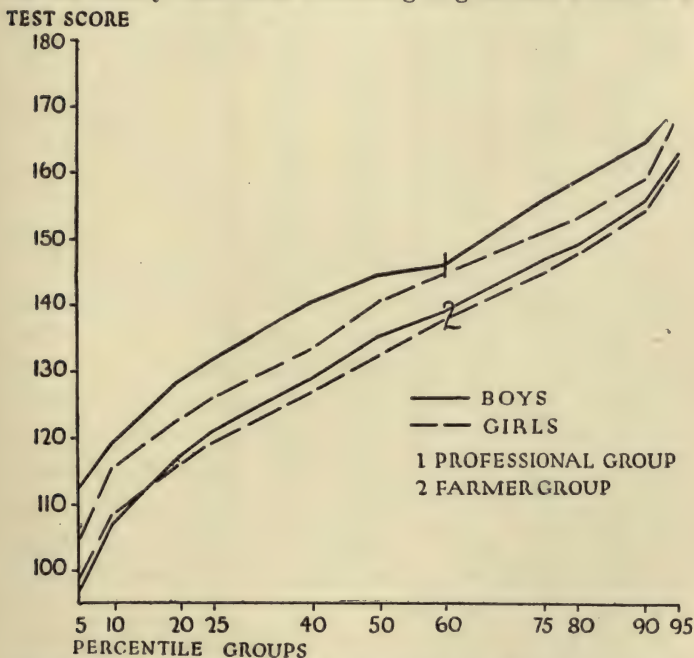


FIGURE 52. — Curves showing scores made by definite proportions of senior boys and girls representing the professional and farmer classes.



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rather select group of individuals. From the representatives of the business executive group we would expect just the opposite showing. Notwithstanding this fact the representatives of the day laborer group made next to the poorest showing on the tests, while the business executive group made next to the best.

TABLE XXXVIII

PERCENTAGE OF SENIORS BELONGING TO EACH OCCUPATIONAL CLASS  
MAKING THE HIGHEST AND LOWEST INTELLIGENCE SCORES

OCCUPA- TIONAL GROUPS	PROFES- SIONAL	CLERI- CAL	SALES- MEN	ARTI- SANS	EXECU- TIVES	LABOR- ERS	FARM- ERS	NO OCCUPA- TION
Per cent rated A <sup>+</sup>	4.42	2.37	2.77	2.33	3.00	.40	1.48	2.25
Per cent rated F	1.26	—	.30	.85	1.00	1.23	1.68	1.84

Table XXXVIII shows the per cent of seniors belonging to each occupational class who received a mental rating on the tests of A<sup>+</sup> or F, and shows that every occupational group contains seniors in the A<sup>+</sup> class and every group except the clerical workers has representatives in the F or lowest intelligence class. From this table and previously presented data it appears that every occupational group had not only representatives in the senior classes of the high school, but had representatives in the group possessing the highest grade of mental ability found among the high school seniors of the entire state.

If we consider all the seniors belonging to each occupational class who made scores on the mental tests which placed them in the *superior* or *very superior* class, we ob-

tain the same relative ranking that was found when we compared these groups on the basis of central tendency. The results of this comparison are presented in Figure 53, which shows the percentage of seniors belonging to each occupational group who made an A or B, and a D, E, or F rating on the mental tests. The different occupational

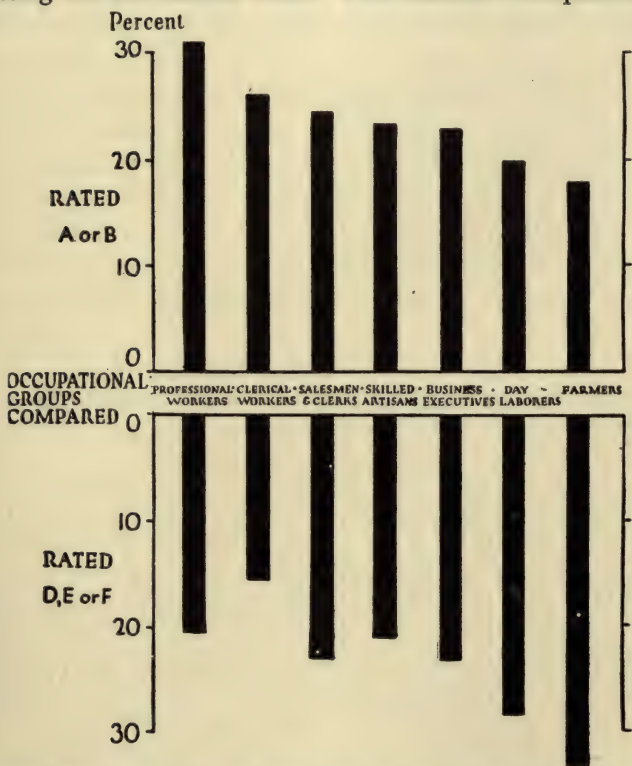


FIGURE 53. — Per cent of seniors belonging to various occupational classes who made the highest (A or B) and the lowest (D, E, or F) grades of intelligence.

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groups are presented in order from the highest to the lowest and they fall in the same order as shown in Figure 50, except that the positions of the salesman and artisan groups are reversed, the former surpassing the latter; as it did when the groups were compared on the basis of the per cent making scores above the median for our total group.

(c) *Number of seniors representing the several occupational groups who scored at the various intelligence levels.* A question of considerable importance is the relative frequency with which each grade of mental ability occurred among the seniors representing each occupational class. Do we find all grades of mental ability represented in each occupational group? Are all grades of intelligence found in equal proportions? On what grades of intelligence does the emphasis fall in different occupational groups?

TABLE XXXIX

DISTRIBUTION OF DIFFERENT GRADES OF INTELLIGENCE AMONG SENIORS BELONGING TO THE DIFFERENT OCCUPATIONAL GROUPS

OCCUPATIONAL GROUPS COMPARED								
PER CENT OF TOTAL GROUP RATED	PROFES- SIONAL	CLERI- CAL	SALES- MEN	ARTI- SANS	EXECU- TIVES	LABOR- ERS	FARM- ERS	No Occu- pation
A or B	30.91	26.06	24.30	23.68	23.14	19.82	18.23	22.89
D, E, or F	20.44	15.64	23.37	20.92	23.43	28.23	33.20	28.01
C <sup>+</sup> , C, or C <sup>-</sup>	48.58	58.28	52.30	55.39	53.11	51.91	48.52	48.06
Total cases	317	211	325	946	998	489	1963	499

To enable us to answer these questions a table was prepared showing the percentage of seniors belonging to the

various groups who possessed each grade of ability from A<sup>+</sup> to F. Table XXXIX combines certain items of these original data and shows the per cent of students belonging to each occupational group who received an intelligence rating indicating superior (A or B), average (C<sup>+</sup>, C, or C<sup>-</sup>), and inferior (D, E, or F) intelligence.

Frequency curves were also drawn from these original tables showing the per cent of seniors belonging to the several occupational groups who possessed each grade of ability from A<sup>+</sup> to F. Figure 54 compares the farmer and professional groups on this basis. The curve for the professional group rises above the farmer curve at all points

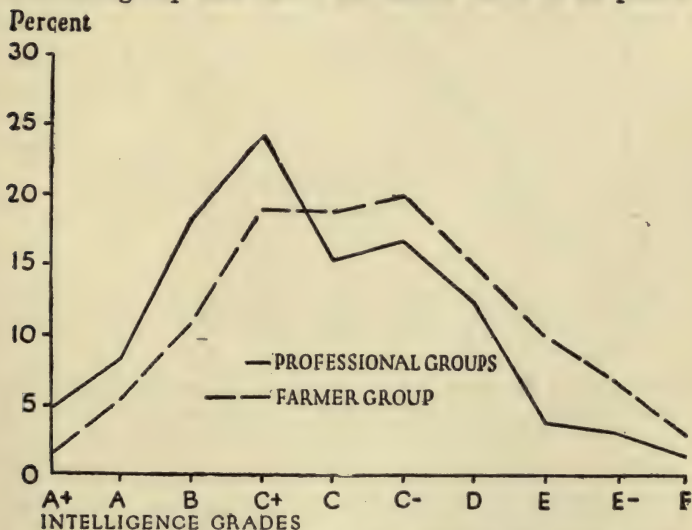


FIGURE 54. — Frequency curves for the farmer and professional groups showing the per cent of seniors representing each of these occupational classes who possess the various grades of intelligence found among high school seniors.



representing the higher grades of ability and drops below it at all points indicating the lower grades of intelligence. The curve for the day laborer group is similar to the curve for the farmer group except that it rises higher at the points representing a C or C- grade of ability. The curves for the other occupational groups would occupy positions between the curves for the professional and farmer or day laborer class, with certain slight shifts for particular

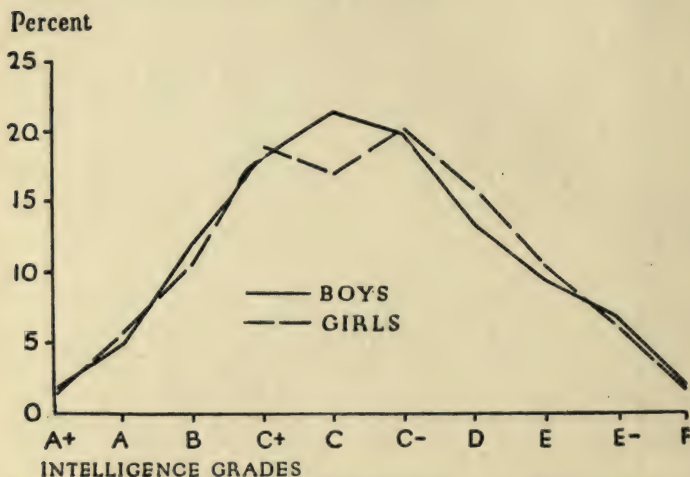


FIGURE 55. — Frequency curves for senior boys and girls belonging to the farmer class. They show the percentage who possess each grade of intelligence found among high school seniors.

grades of mental ability. In the curves representing clerical workers, skilled tradesmen, and business executives there are marked rises at the points indicating the average (C+, C, and C-) grades of intelligence. For some groups (clerical workers) this rise is towards the upper sector, *i.e.*

higher for the C<sup>+</sup> grade of ability; for other groups (day laborers) the curve reached its highest point at the C<sup>-</sup> level.

**4. Sex differences.** Certain differences between the records made by the boys and girls coming from different occupational classes are of sufficient importance to be presented. Frequency curves were drawn for the boys

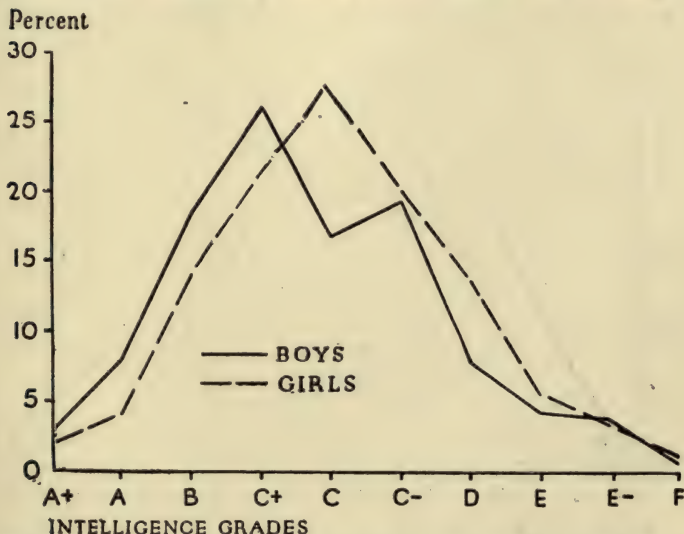


FIGURE 56. — Frequency curves for boys and girls representing the skilled artisan class. They show the percentage who possess each grade of intelligence found among high school seniors.

and girls belonging to each occupational class. Sample records of selected groups are shown in Figures 55 to 59. As may be seen from an inspection of these figures, the sex curves for the farmer group run almost parallel, as do the curves for the clerical group. For the artisan

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and day laborer groups, the curves for the boys rise above the curves for the girls at all points indicating the higher grades of intelligence, and drop below them at all points representing the lower grades of mental ability.

The same unusual difference in favor of the boys representing various occupational classes was shown in Figure 51 above. This suggests that only the brighter boys from

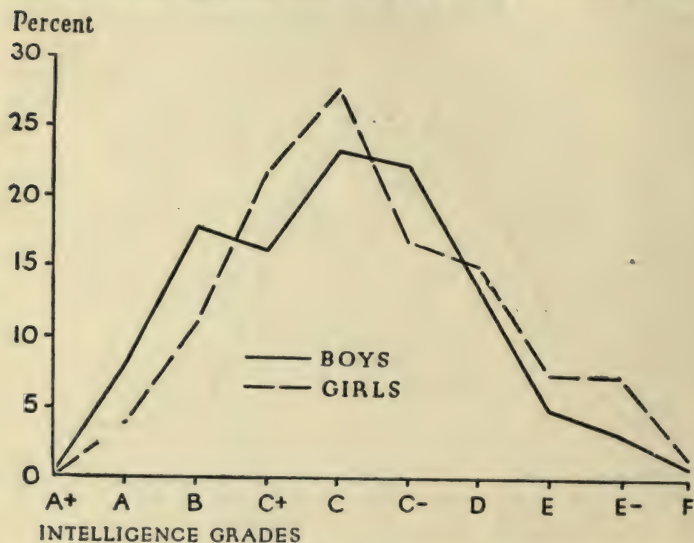


FIGURE 57. — Frequency curves for senior boys and girls representing the day laborer class, showing the percentage who possess each grade of intelligence found among high school seniors.

the laborer and artisan classes are being graduated from high school, while a greater proportion of the girls representing these two occupations complete a high school course. The fact that the sex differences are less marked between the boys and girls representing the other occupa-

tional classes would tend to show that boys from the former occupational classes are found in high school in smaller proportions.

**5. General summary.** The more important facts contained in this chapter may be summarized as follows:

1. All occupational groups are represented in the senior classes of Indiana high schools, but not in natural propor-

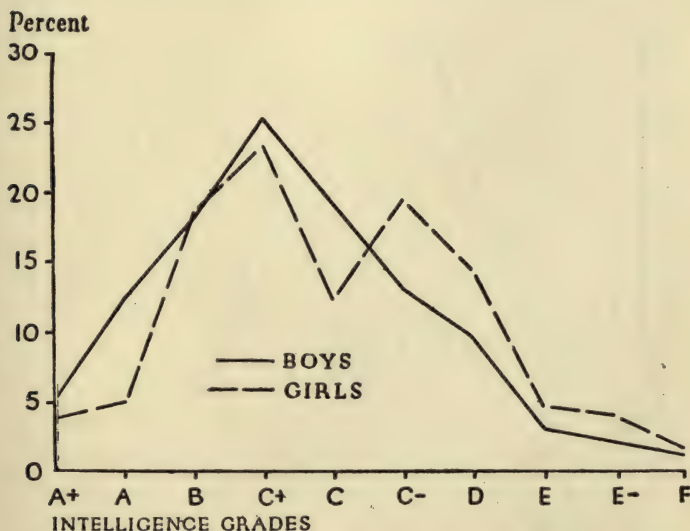


FIGURE 58. — Frequency curves for senior boys and girls representing the professional class, showing the percentage possessing each grade of intelligence.

tion. Parents representing the executive, foreman, and business pursuits had more than their proportionate representation. Day laborers had less than half their normal allotment; the other occupational classes had about the



representation which their position in the state would lead us to expect.

2. Each occupational group had representatives in the highest 1 percentile group — and all but one occupation (clerical workers) had representatives in the class possessing the lowest grade of mental ability found among high school seniors.

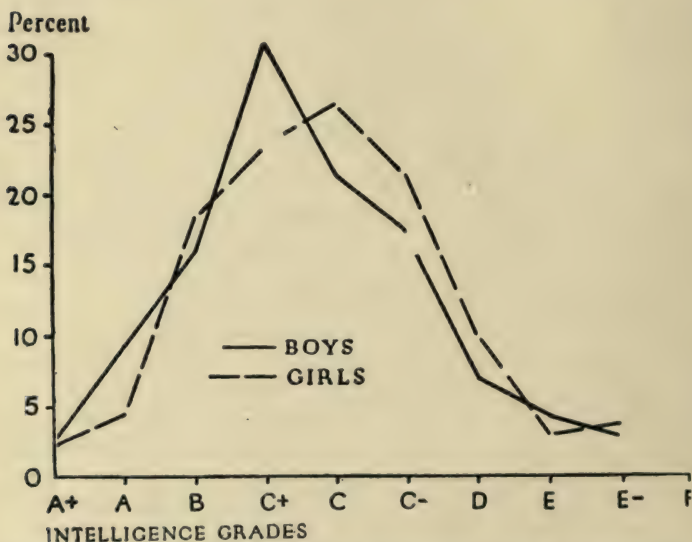


FIGURE 59. — Frequency curves for senior boys and girls representing the clerical workers class showing the percentage possessing each grade of intelligence.

3. If considered on the basis of central tendency or on the basis of the percentage belonging to each occupational class whose mental test scores gave them a superior (B) or very superior (A) mental rating, some very definite and

marked differences appear between the representatives of the several occupational groups. The children of professional parentage rank highest in all these comparisons. The children from the farmer and day laborer classes rank lowest. The seniors from the other occupational groups rank between these extremes.

4. The boys from each occupational class rank consistently higher than the girls representing the same occupation, suggesting a natural selection of the brightest boys. For certain occupational groups, *e.g.* the professional, artisan, and day laborer classes this process of selection has seemingly taken place to a more marked degree than for other occupations. That is to say, the boys rank relatively higher for these occupational classes than for the others, suggesting that only the brighter boys from these occupational classes remain to finish a high school course.

6. **Discussion of results.** From the data presented in this chapter it appears that while all occupational classes have representatives in the senior classes of the high schools of the state, they are not equally well represented. There are proportionately more than twice as many seniors coming from the business executive and commercial group as the relative importance of this occupation in the state would lead us to expect. The farmer group also had more than its quota of representatives. The skilled artisan and day laborer classes, on the other hand, had fewer representatives than we should expect. To what is this inequality due? Why is the day laborer and skilled artisan class less adequately represented than it should be and why do farmers and business men

have more than their share of representatives in the graduating classes of Indiana high schools? Is the reason financial? The business men of the state are the money makers and the farmers are certainly well able to send their children to high school. Is the inequality due to a lack of mental ability on the part of the children coming from the day laborer class? Our distribution tables showed that this occupational group had proportionately about as many representatives possessing the highest grade of intelligence found among high school seniors as any other occupational group, though the general level of ability of the group was next to the lowest (farmer group). If the law of the survival of the fittest operates, it would mean that the rather low level of mental ability of the children of this occupational class was still lower than our figures show. The rather full representation from the business and farmer groups would help to account for the poor mental showing made by these occupational groups on the tests. Or shall we say that the unequal representation of the several occupational groups means that our high schools are better adapted to the needs of the professional, clerical, and business groups than to those of the artisan and day laborer classes?

Perhaps the most important circumstance revealed by this chapter is the fact that all occupational groups are actually represented in the senior classes of our high schools. This shows that our high schools are democratic in a real sense and means that every effort should be made to adapt their work to the *variety of interests and vocational needs* which a democratic society presents.

The inequalities in mental strength found among the representatives of these various occupational groups is a condition of special interest and far-reaching significance. The evidence is clear that there are marked differences between individuals belonging to various occupational classes — differences which by heredity manifest themselves in the children of the various occupational groups who attend our public schools. This means that the work of the public schools, to be truly democratic, must be adjusted to these individual differences in ability as well as adapted to the needs of individuals varying so greatly in the occupations which they will follow in later life. In a school which presumably serves *all the people*—it will not suffice to set up a traditional course of study fashioned *for* and adapted *to* the needs and interests of a few occupational groups. The schools must be adapted to the mental inequalities and varying interests of the entire population.

The importance of the economic side of the problem will be shown in the following chapter. If later investigations should show that the reason for the poor representation from the day laborer class in our high schools is chiefly financial, this discovery will be extremely significant. If a real difference in mental ability exists, this fact is equally important. Even as the case now stands there is abundant evidence to show that many who are now mere “hewers of wood and drawers of water” have the native mental ability to do some of the highest types of work, but are bound down by economic conditions and the law of habit over which they



have no control, and so are totally unable to take up lines of work better suited to their native interests and intellectual strength. As will be shown in the following chapter mere wealth is no guarantee of intellectual endowment.

## CHAPTER XI

### INTELLIGENCE OF HIGH SCHOOL SENIORS REPRESENTING DIFFERENT ECONOMIC CLASSES

A QUESTION of considerable importance is the relation that exists between the intelligence of high school seniors and the economic status of their parents. Are the most intelligent people in the state also the wealthiest? Does it require a high degree of native mental ability to accumulate wealth? Is a high yearly income a sure index of superior intelligence? What economic groups have the best mentally endowed children in the high school? If mental ability is inherited, as is generally assumed, a comparison of the mental ratings made by the seniors belonging to the different economic groups actually represented in the high school should give important information bearing on these points. Such intelligence rankings can, however, be considered only as they pertain to the product of the high schools which in all probability are not truly representative of all economic classes.

To enable us to compare the representatives of different economic groups each senior taking the intelligence tests was asked to state the yearly income of his father during the year previous to the examination. In case this was not known, the student was asked to give an estimate and to indicate in his answer that it *was* an estimate. This item was afterwards checked by the principal or teacher in charge of the mental examination, who was asked to verify the student's statement. Reliable answers were

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secured from 4346 of the 5748 seniors used in these comparative studies, 1898 boys and 2448 girls. The others either failed to answer this question or gave ambiguous information, which was discarded.

TABLE XL

PERCENTAGE OF HIGH SCHOOL SENIORS BELONGING TO DIFFERENT ECONOMIC GROUPS

ECONOMIC GROUPS COMPARED	1	2	3	4	5
	Salary, \$4500- 12,000	Salary, \$3000- 4500	Salary, \$2000- 3000	Salary, \$1000- 2000	Salary, \$500- 1000
Total cases . . . . .	370	199	724	1964	1089
Per cent of seniors . . .	8.51	4.58	16.67	45.19	25.04

To make a comparison possible between the representatives of different economic classes we grouped them as follows: (1) those whose parents' annual income ranged from \$4500 to \$12,000 or more; (2) those having a yearly income of \$3000 to \$4500; (3) those earning \$2000 to \$3000 per year; (4) those making from \$1000 to \$2000 per year; (5) those having an annual income of \$500 to \$1000 per year. Tabulations were then made in such a way that the test scores made by the students belonging to each of these economic groups could be compared with one another and with our total or standard group.<sup>1</sup> Table

<sup>1</sup> We have no figures showing the number of family heads there were in the state in 1918-19 who had these different grades of income. But the percentage of seniors who belong to each class is significant. It will be seen that almost half the group belong to class four (annual income \$1000 to \$2000) and one-fourth to class five (annual income less than \$1000).

XL shows the per cent of seniors belonging to the various economic groups.

These several economic groups were compared (1) on the basis of the general level of intelligence possessed by each group; (2) on the basis of the number of seniors belonging to each group who possessed the highest grades of intelligence; and (3) on the basis of the frequency with which these several grades of intelligence occurred among the members of each group. The results of these comparisons are presented in tables and curves, which follow.

**1. General level of ability of the seniors belonging to different economic groups.** The groups were first compared on the basis of the scores made by the middle 50 per cent of the individuals belonging to each economic group. The results of this comparison are shown in Figure 60, which enables us to compare the records made by the middle 50 per cent of each group with each other and with our state standard. There is but little difference between the intelligence of the individuals representing the first four groups. There is, however, a marked difference between the records made by the seniors belonging to these high-income groups and those whose parents' income was less than \$1000 per year.

The same fact is shown in another way if we compare these several groups on the basis of the per cent belonging to each who made scores on the intelligence tests above the state median. These figures are given in Table XLI.

If the sexes are combined, we get a slight but continuous decline as we pass from the highest to the lowest salaried group, and a *marked* decline for the lowest salaried group.



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But the most significant fact revealed by the latter comparison is the marked difference which appears between the records made by the boys and girls coming from the wealthier groups. Nearly 9 per cent more boys than girls belonging to the two highest salaried groups made scores above the state median. (Compare Figure 60 and Table XLI.) This same fact is shown in Figure 60 by the comparatively low median score made by the girls representing the wealthier groups. For the groups representing parents whose annual incomes range from \$500 to \$1000 and \$2000 to \$3000 we find only the usual amount of difference between the records made by the boys and girls. For the highest income groups the boys make records far superior to those of the girls.

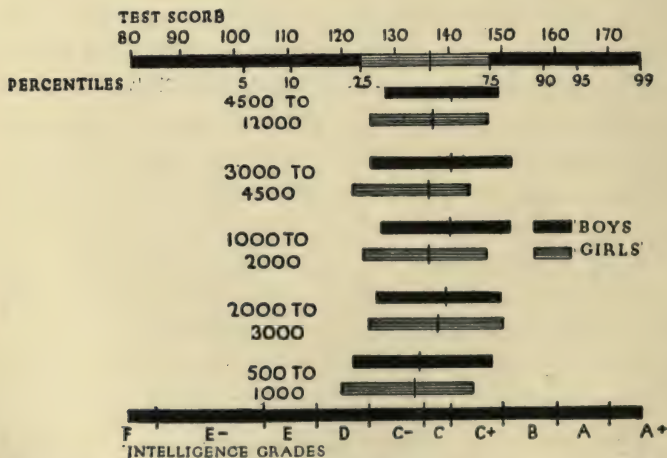


FIGURE 60.— Scores made by the middle 50 per cent of senior boys and girls representing different economic strata or groups.

TABLE XLI

PERCENTAGE OF SENIORS BELONGING TO EACH ECONOMIC GROUP  
WHO MADE SCORES ABOVE THE STATE MEDIAN

ECONOMIC GROUPS COMPARED	1	3	2	4	5
	Salary, \$4500- 12,000	Salary, \$2000- 3000	Salary, \$3000- 4500	Salary, \$1000- 2000	Salary, \$500- 1000
Sexes combined . . . . .	54.59	53.17	52.76	51.68	43.43
Boys . . . . .	58.94	54.20	56.58	53.75	44.27
Girls . . . . .	50.00	52.45	48.35	51.47	42.23

2. **Location of the brightest seniors.** When we determine which economic group furnished the largest percentage of seniors possessing the higher grades of intelligence we secure different results. All economic groups except the highest salaried group are represented in the highest one percentile class. Table XLII shows the percentage of students belonging to each economic group whose mental test score gave them a rating of A<sup>+</sup> or A, the highest grades made on the tests, also the percentage making a mental rating of E<sup>-</sup> or F, the lowest grades of intelligence possessed by our total or standard group. Groups 2, 3, and 4, where the income varied from \$1000 to \$4500, have the largest percentage of seniors rated A<sup>+</sup>, and groups 1 and 5 the smallest. Groups 3 and 4 are superior to group 2 in the per cent of students rated A<sup>+</sup> or A.

From a study of our distribution tables it appears that neither group 1 nor group 5 contain students who score above 180 points in the tests. But seniors possessing

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this grade of ability were found in each of the other economic groups. The brightest students belong to group 4, the annual income of whose parents ranged from \$1000 to \$2000. Eight students belonging to this group, 6 boys and 2 girls, made scores over 185. And 5 students in our lowest economic group (annual income \$500 to \$1000) made scores ranging from 175 to 180, while there was but a single student in our highest salaried group who made a score above 175 points.

TABLE XLII

PER CENT OF STUDENTS IN EACH ECONOMIC GROUP POSSESSING  
THE HIGHEST OR LOWEST GRADES OF ABILITY

ECONOMIC GROUPS COMPARED	1	2	3	4	5
	Salary, \$4500- 12,000	Salary, \$3000- 4500	Salary, \$2000- 3000	Salary, \$1000- 2000	Salary, \$500- 1000
<i>Per cent rated:</i>					
A <sup>+</sup> . . . . .	1.89	3.01	2.48	2.49	.82
A <sup>+</sup> or A . . . . .	7.56	7.53	10.07	8.24	5.68
F . . . . .	1.08	1.50	.55	.81	1.92
E <sup>-</sup> or F . . . . .	5.13	6.52	4.69	5.03	8.99
Total cases . . . . .	370	199	724	1964	1089

If we count all students whose test score gave them a mental rating of A<sup>+</sup>, A, or B, these various economic groups arrange themselves as shown in Figure 61: Group 3 (income \$2000 to \$3000) comes first; group 2 (annual income of \$3000 to \$4500) comes second; group 4 (annual income \$1000 to \$2000) ranks third; while the highest and lowest salaried groups come last.

A significant sex difference for groups 2 and 4 is shown in Figure 62. These groups have an unusually large number of boys ranked A or B and a relatively small number of girls making this ranking. If we take into account sex differences, the groups would be arranged as follows for the boys, 2, 4, 3, 1, and 5; for the girls, 3, 4, 1, 2, and 5.

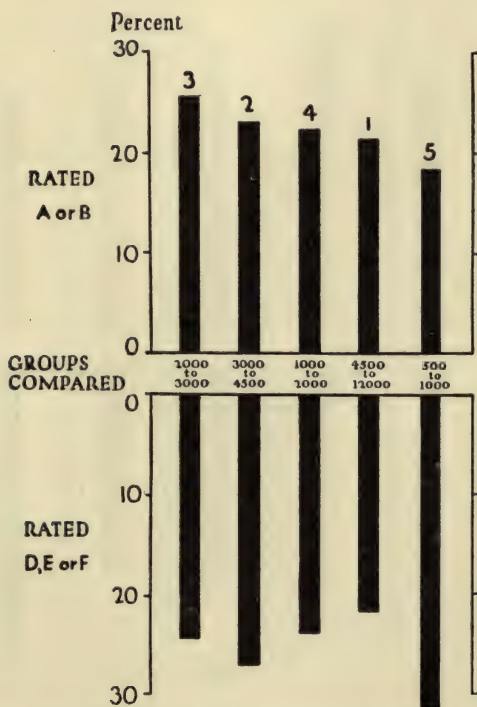


FIGURE 61. — Percentage of seniors representing different economic classes who made the highest (A or B) and the lowest (D, E, or F) intelligence scores on the tests.



If we compare the records made on our tests by the group of seniors representing the richest and poorest homes, we find that there are proportionally more children possessing the highest grades of mental ability among the poorest class than among the wealthiest class, and more individuals with high average grades of intelligence among

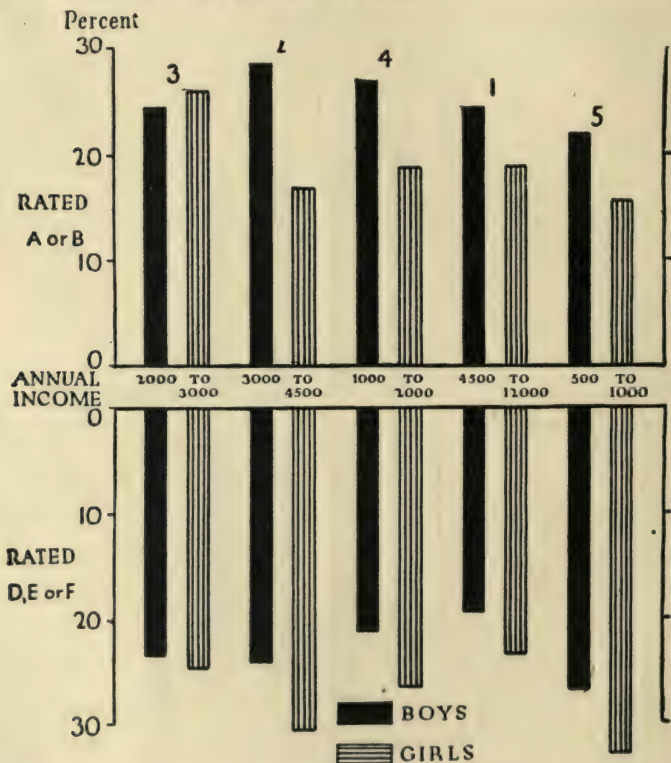


FIGURE 62. — Percentage of senior boys and girls belonging to each economic class who made the highest (A or B) and the lowest (D, E, or F) intelligence rating on the tests.

the wealthier than among the poorer group. The wealthiest group ranks high on central tendency. The poorest salaried group ranks low on central tendency and also has a larger percentage of individuals possessing the lower grades of mental ability. But there are individuals in this class who obtain the highest intelligence rating made by high school seniors.

Percent

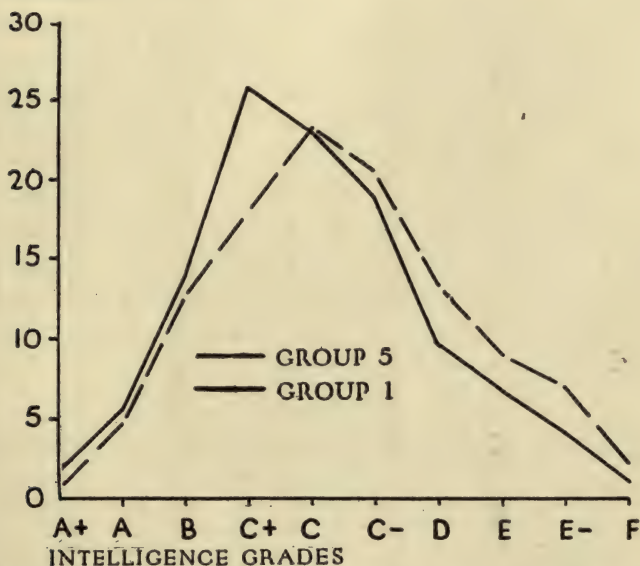


FIGURE 63. — Frequency curves for seniors representing the most wealthy (group 1) and least wealthy (group 5) parents. The curves show the percentage belonging to each group who possess each grade of intelligence found among the high school seniors of the entire state.

3. Number of seniors in each economic group who score at the various intelligence levels. A table was pre-

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pared showing the percentage belonging to the several economic groups who possessed each grade of intelligence from A<sup>+</sup> to F, and curves were drawn showing the frequency with which these grades of intelligence occurred among the individuals belonging to different groups. Table XLIII combines certain of these results and shows that more students belonging to the wealthiest class made scores above the state median than was the case for any other group, but that a relatively large proportion of these students were only rated C<sup>+</sup>. This is clearly shown by the frequency curves for this group given in Figure 63, which compares group 1 (annual income over \$4500) with group 5 (annual income \$500 to \$1000). The curve for group 1 rises above the other curve at all points indicating the higher grades of mental ability and drops below it at all points indicating the lower grades of intelligence. An unusually large percentage of individuals belonging to group 1 are rated C<sup>+</sup>, as is shown by the height of the curve at that point.

TABLE XLIII

PERCENTAGE BELONGING TO EACH GROUP POSSESSING DIFFERENT GRADES OF INTELLIGENCE

ECONOMIC GROUPS COMPARED	3	2	4	1	5
	Salary, \$2000- 3000	Salary, \$3000- 4500	Salary, \$1000- 2000	Salary, \$4500- 12,000	Salary, \$500- 1000
<i>Per cent rated:</i>					
A or B . . . . .	25.26	23.10	22.49	21.66	18.45
D, E, or F . . . . .	24.57	27.13	24.06	21.67	31.32
C <sup>+</sup> , C, or C <sup>-</sup> . . . . .	50.26	49.73	53.49	56.74	50.31
Number of cases . . . . .	724	199	1964	370	1089

Figure 64 compares group 3 (annual income \$2000 to \$3000) with group 5 (annual income \$500 to \$1000), and shows group 3 to be superior to group 5 in the relatively large percentage of students belonging to the group rated A or B. This is shown by the rise of the curve at the points indicating these grades of ability. The frequency curves for groups 2 and 4 are similar to the curve for group 3. In fact they practically coincide with the curve at all levels of ability.

4. Summary of results. The more important facts

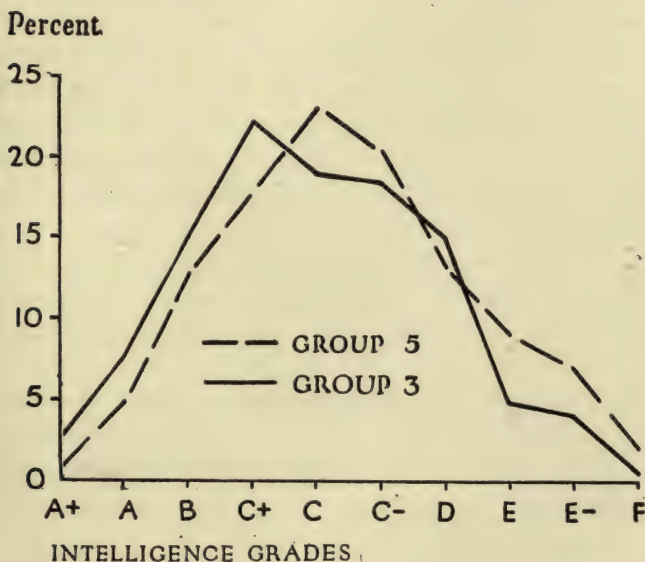


FIGURE 64. — Frequency curves for seniors representing the poorest (group 5) and well to do (group 3) parents, showing percentage who possess each grade of intelligence found among high school seniors.



brought out by this comparison of different economic groups may be summarized as follows:

1. The brightest seniors did not come from the wealthier groups. Children of parents in moderate economic circumstances (annual income \$1000 to \$2000) rank highest on the mental tests. (See Table XLII.) But the wealthier homes furnish more seniors of average and high average ability than do the humbler homes.

2. Only slight differences were found between the intelligence of the students coming from homes where the annual income varied from \$1000 to \$12,000, but marked differences were found among the intelligence levels for these groups and the group coming from homes where the annual income was below \$1000 per year. The latter group rated decidedly below the other groups in the per cent making grades above the state median, in median score, and in the percentage possessing the highest (A or B) grades of intelligence.

3. All economic classes had representatives in the high school and among the group rated A<sup>+</sup> on the intelligence tests. Taken as a whole the seniors endowed best mentally belong to groups 3 and 4.

4. The sex differences revealed in this chapter are probably not significant unless the marked superiority shown by the boys coming from the wealthiest groups has some significance.

## CHAPTER XII

### INTELLIGENCE OF HIGH SCHOOL SENIORS COMING FROM DIFFERENT COMMUNITIES AND SCHOOLS

INDIVIDUAL differences found among school children, high school students, and adults — differences in mental capacity or ability to learn, in vital capacity or endurance, in ability to recover from fatigue, in the strength and kind of special abilities possessed — are now clearly recognized by all and have been much studied. But the fact that there are differences between *groups* of individuals which are important for a correct solution of many of our social and educational problems has been recognized by only a few. Differences between children in the same grade but attending different schools, differences between the children attending different buildings in the same city, differences between schools located in different communities, differences between various social and occupational groups — these group differences while as marked and varied as those found among individuals are only beginning to be investigated.

The importance of these group differences will be recognized as soon as they are pointed out and the fact of their existence demonstrated. Take for example the matter of high school accrediting. We have been working on the theory in Indiana that high schools located in every part

of the state and in every type of community should measure up to the same standard of efficiency and achievement regardless of the mental strength or character of the raw human material with which these schools have to work. The efficiency and achievements of these high schools have been evaluated by our high school inspectors wholly on the basis of accomplishment, in total disregard of any inequalities in the native mental strength of pupils. All have been considered equal and recommended for commissions to the state board of education if they have met the standard requirements regarding equipment and the character and training of their teaching force. The result is that the accomplishment of a "one-talent" school has been judged by the same standards as a "ten-talent" school. Furthermore, our colleges and universities have been working on the theory that all high schools so standardized would provide satisfactory material for the college, provided they safeguarded their courses of study, the training of their teachers, and made sure that their material equipment and the character of the instruction was up to standard. Little attention has been given to the matter of obtaining real standards for evaluating the product of these high schools or for measuring their accomplishment. That vital differences might be found among the pupils in these schools has not been taken into consideration.

If such group inequalities exist, they should be determined and the character and degree of difference pointed out. That such group differences between sections of the same grade, between schools in different communities, and between individual schools do exist has been shown by inves-

tigations from our own laboratory.<sup>1</sup> We therefore desired to measure and describe in this study such inequalities in the native mental endowment of high school seniors representing different communities and different individual schools, as might be found to exist. We wished to acquaint teachers and school officials with these differences in order that they might better adjust the work of their schools to the varying capacities and needs of their pupils.

Several different kinds of comparisons will be made in this chapter: (1) the intelligence of seniors coming from high schools of different sizes or ranks; (2) the intelligence of seniors coming from the northern, central, and southern sections of the state; (3) the intelligence of seniors coming from rural and city high schools; (4) the intelligence of seniors representing strictly agricultural, manufacturing, and mining communities; (5) the intelligence of seniors coming from the best and the worst economic sections of the state; (6) the grades of intelligence possessed by seniors coming from individual schools of the same size and rank but located in different parts of the state; (7) the intelligence of seniors from high schools located in the same city or county; (8) the distribution of different grades of intelligence among the seniors of different individual schools; (9) the location and geographical distribution of the ablest seniors found in the state will be shown by means of a map.

*Method.* In order to study sectional differences we divided the state into three districts, a *northern*, a *central*

<sup>1</sup> Pressey, S. L., "A Comparison of Two Cities and Their School Systems by Means of a Group Scale of Intelligence," *Educational Administration and Supervision*, Vol. V, 1919, pp. 53-62.



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and a *southern* section, as is shown on the map in Figure 80. The individual schools were then grouped into eight different ranks, based upon the size of their senior class. All schools whose senior class consisted of 100 or more students were classed as rank 1; schools whose senior class numbered from 75 to 100 were given rank 2; 50 to 74, rank 3; 35 to 49, rank 4; 20 to 34, rank 5; 10 to 19, rank 6; 6 to 9, rank 7; and 1 to 5, rank 8. Table XLIV shows the number of schools belonging to each of these ranks.

To determine all inequalities in mental strength found in the individual high schools of the state, we retabulated the intelligence scores made by the senior class of each school. This enabled us to compare not merely *individual* schools of the same rank in different cities, counties, communities, and sections of the state, but to ascertain the different grades of intelligence that were found in the senior classes of different schools and to see how different grades of mental ability were distributed in any particular school.<sup>1</sup> The facts revealed by these various comparisons are presented below.

**1. Intelligence of seniors coming from schools of different rank.** The distribution of the different grades of intelligence found among the seniors from high schools of different rank is shown in Table XLIV, which gives

<sup>1</sup>Only a few facts revealed by this comparative study of individual schools can be given in this report, but the individual school records as well as all original data collected have been placed on file in the Psychological Laboratory at Indiana University for reference. Any superintendent or teacher desiring information with regard to any particular school not contained in this report may obtain it by writing to W. F. Book, head of the Department of Psychology, Indiana University, Bloomington.

the results for all schools in the state by ranks. The proportion of seniors possessing superior grades of intelligence is shown by the per cent belonging to each rank who were rated A or B; the proportion of pupils possessing the most inferior grades of intelligence by the per cent rated D, E, or F. The general level of intelligence for each rank is indicated by the median score for the rank, and by the per cent who made scores above the state median. The distribution of different grades of ability for each rank is shown by the per cent of students who obtained the various intelligence ratings from A<sup>+</sup> to F.

TABLE XLIV

PER CENT OF SENIORS IN SCHOOLS OF ALL RANKS WHO POSSESS DIFFERENT GRADES OF INTELLIGENCE

RANK	SCORING ABOVE 175	PER CENT RATED					SCORING ABOVE STATE MEDIAN	MEDIAN FOR RANK	TOTAL CASES	No SCHOOLS
		A <sup>+</sup>	A or B	D, E, or F	C <sup>+</sup>	C or C <sup>-</sup>				
1	.92	1.72	21	24	24	31	53	138	1035	7
2	2.30	3.69	28	18	24	30	58	141	434	6
3	2.13	3.20	31	22	21	25	59	141	753	12
4	1.60	3.09	27	21	27	25	60	142	817	21
5	1.29	2.24	21	28	20	31	48	136	1186	50
6	.66	1.39	19	34	18	29	45	133	1219	92
7	1.37	2.74	20	30	20	30	46	135	585	85
8	1.25	3.13	21	25	22	32	48	136	162	47

An examination of the table shows some rather marked differences between the schools of the various ranks. Figure 65 shows the relative number of A and B students in the schools of each rank. On this basis of comparison the order of excellence is as follows: Rank 3 first, then

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2, 4, 8, 5, 1, 7, with rank 6 last. As shown by the data contained in Table XLIV and Figure 65, practically the same order of merit is maintained if we compare them on the basis of median score and the per cent of seniors belonging to each rank who made scores above the state median.

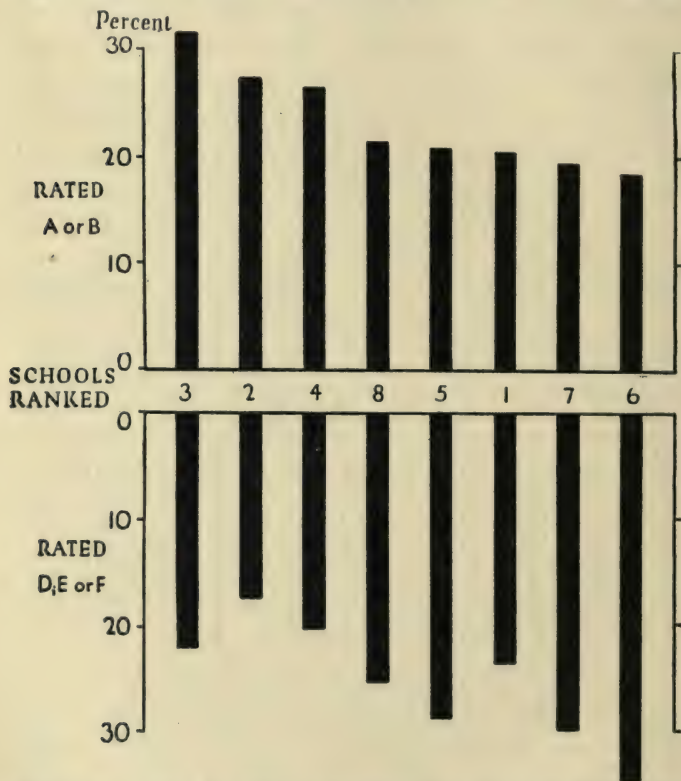


FIGURE 65. — Per cent of seniors coming from schools of various sizes or ranks who obtained the highest (A or B) and lowest (D, E, or F) intelligence ratings on the tests.

We next made a comparison between the smaller and the larger schools of the state. This showed more clearly the superiority of the city schools belonging to ranks 2, 3, and 4. Our data show that these schools possess better senior material than the schools of any other rank. That is to say, a greater percentage of the seniors coming from these schools are ranked A or B on the intelligence tests than were found in any other rank of high school. There are also more seniors in these schools who make scores above the state median (60 per cent) as against 53 per cent in the larger city schools, their nearest competitors. They also excel in median score. The median score for all the schools ranked 2, 3, and 4 is 141.21, or 4.21 points higher than for the schools ranked 1, which stood next to this rank. It will also be seen by consulting Table XLIV that there are relatively more seniors belonging to these ranks who made scores in the mental tests entitling them to an intelligence grade of A<sup>+</sup>, and that the proportion of these highly endowed individuals was about the same in each of these ranks. The smallest schools in the state, those ranked 7 and 8, come next. Rank 3 had the largest percentage of students rated A or B, 31.46 per cent. The schools ranked 4 had a smaller percentage of seniors rated A or B than either rank 2 or 3. But it had more students rated C<sup>+</sup> than any other rank. The schools belonging to rank 2 had more students rated C or C<sup>-</sup>, which made the percentage of students belonging to each of these three ranks scoring above the state median about equal, as we have noted above. Taken as a whole, however, and comparing the several ranks not merely on the basis of central tendency



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but on the proportion of seniors belonging to such rank who possess each grade of intelligence, the schools ranked 3 made the best showing, and those ranked 6 the worst showing. These and other facts are shown by the data presented in Tables XLIV and XLV.

TABLE XLV

PER CENT OF SENIORS IN THE LARGEST AND THE SMALLEST HIGH SCHOOLS WHO POSSESS VARIOUS GRADES OF INTELLIGENCE

SCHOOLS RANKED	SCOR- ING ABOVE 175	PER CENT RATED					SCORING ABOVE STATE MEDIAN	MEDIAN SCORE FOR GROUP
		A+	A or B	D, E, or F	C+	C or C-		
5, 6, 7, and 8	1.14	2.37	20	29	20	31	47	135
7 and 8 . .	1.31	2.93	20	27	21	32	47	135
2, 3, and 4	2.01	3.33	29	20	24	27	60	141
1 . . . . .	.92	1.71	21	24	24	31	53	138
6 . . . . .	.66	1.39	19	34	18	29	45	133
5 and 6 . .	.97	1.81	20	32	19	29	46	135

2. Intelligence of seniors coming from the northern, central, and southern sections of the state. The scores made on the intelligence tests by seniors from all schools located in the northern, central, and southern parts of the state were compared on the same basis as has been used throughout this report. These sections are known to be different in important economic respects and it was thought likely that they might be equally different from a psychological point of view. The division of the state into sections was made as indicated on the map shown in Figure 80. The more important results obtained by the sectional comparison presented in detail in Table XLVI, and summarized in Table XLVII, are

as follows: (1) All types of schools in the northern part of the state are superior to the schools of corresponding rank in the southern section; (2) northern schools of all rank save 7 and 3 are superior in the native mental endowment of their senior classes to the schools of the central section; (3) the schools of the central section are slightly superior to the schools of the southern section for all ranks except 5, 6, and 1. The difference in favor of the schools in the southern section ranked 5 and 6 is very slight, almost negligible. For rank 1 there is but a single school in the southern part of the state which stands decidedly higher on every basis of comparison than the average for schools of a similar rank in the central section. (Compare Table XLVI below.)

TABLE XLVI

PER CENT OF SENIORS IN NORTHERN, CENTRAL, AND SOUTHERN SECTIONS OF STATE SCORING AT VARIOUS INTELLIGENCE LEVELS

TYPES OF SCHOOL	PER CENT RATED					PER CENT SCORING ABOVE STATE MEDIAN	MEDIAN FOR GROUP	CASES	NUMBER OF SCHOOLS
	A+	A or B	D, E, or F	C+	C or C-				
<i>Rank 8</i>									
Northern	1.35	23	19	24	34	51	138	74	20
Central	—	16	30	21	33	40	133	43	14
Southern	—	15	33	18	34	39	133	40	13
<i>Rank 7</i>									
Northern	1.81	19	31	21	29	45	135	276	39
Central	5.58	20	26	22	32	48	136	197	29
Southern	—	10	30	20	40	40	133	96	17
<i>Rank 6</i>									
Northern	1.35	19	32	20	29	44	134	594	43
Central	.59	18	33	16	33	41	133	337	26
Southern	1.05	18	36	19	27	43	134	285	23

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TABLE XLVI — *Continued*

PER CENT OF SENIORS IN NORTHERN, CENTRAL, AND SOUTHERN SECTIONS OF STATE SCORING AT VARIOUS INTELLIGENCE LEVELS

TYPES OF SCHOOL	PER CENT RATED					PER CENT SCORING ABOVE STATE MEDIAN	MEDIAN FOR GROUP	CASES	NUMBER OF SCHOOLS
	A+	A or B	D, E, or F	C+	C or C-				
<i>Rank 5</i>									
Northern	.45	24	20	23	33	56	139	441	18
Central	.59	15	35	17	33	39	133	337	15
Southern	.57	15	35	20	30	41	133	351	17
<i>Rank 4</i>									
Northern	1.14	26	18	28	28	62	141	352	9
Central	.79	23	18	32	27	61	142	253	7
Southern	1.40	17	31	23	29	45	134	215	5
<i>Rank 3</i>									
Northern	.62	26	27	20	27	52	138	323	5
Central	.00	23	24	27	26	56	140	181	4
Southern	.80	24	26	20	30	52	138	125	3
<i>Rank 2</i>									
Northern	1.50	27	16	25	32	58	141	264	3
Central	.59	14	31	20	35	41	134	170	3
Southern	No schools								
<i>Rank 1</i>									
Northern	No schools								
Central	1.44	19	25	23	33	49	137	905	6
Southern	—	25	9	38	28	70	143	130	1

If all schools in each section of the state are combined, these sectional differences become more apparent. Table XLVII shows that the northern section ranks decidedly higher than the central, and the central higher than the southern.

TABLE XLVII

PER CENT OF TOTAL SENIORS IN NORTHERN, CENTRAL, AND SOUTHERN SECTIONS SCORING AT VARIOUS INTELLIGENCE LEVELS

SECTIONS	SCORING ABOVE 175	PER CENT RATED					SCORING ABOVE STATE MEDIAN	MEDIAN SCORE FOR SECTION
		A+	A or B	D, E, or F	C+	C or C-		
Northern	.43	1.12	23	24	23	30	52	138
Central	.54	1.32	19	28	22	31	48	136
Southern	.24	.72	17	31	22	30	46	135

It should also be pointed out that the schools in the northern section are superior to the schools in the southern section for every level or grade of ability. This is clearly shown by the curves in Figure 66, showing the record made on the tests by definite proportions of seniors representing all the schools in the northern and southern sections. The curve for the schools in the northern section is higher at every point than the curve representing the schools in the southern section. The percentile curve for the schools in the central section would, if drawn, pass about midway between the curve for the northern and southern sections, as might be inferred from the data given in Table XLVII. The most striking and significant feature about the curves shown in Figure 66 is the great divergence at the lower end of the distribution and their gradual convergence at the higher levels. This is due to the fact that we find a larger proportion of seniors in the schools in the southern part of the state with inferior and very inferior mental ability than in the northern section, while at the same time the range of intelligence for the seniors in the southern section



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of the state extends higher than for the northern section, there being more seniors with *very superior* mental ability in the smaller schools of the southern part of the state than in the schools of the northern section.

The relative frequency of various grades of ability in the high schools of the northern and southern sections of the

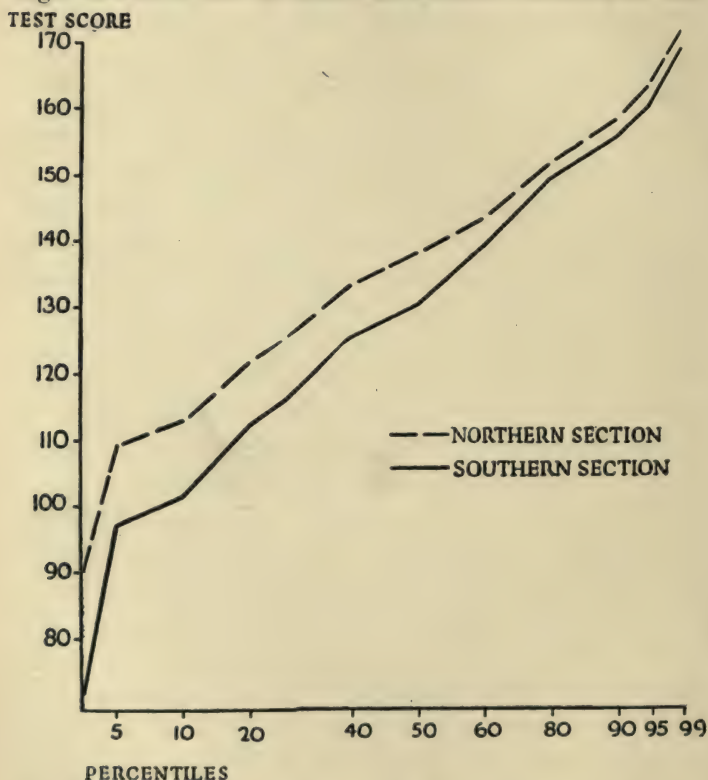


FIGURE 66. — Curves showing scores made by various percentile groups of seniors from the northern and southern sections of the state.

state is shown by the curves in Figure 67. The upper curve represents all schools, regardless of rank, in the northern section; the lower curve all schools in the southern section. It will be noted that the schools in the northern section exceed in the proportion of students rated A<sup>+</sup>, A, or B, while the southern section has a larger percentage of seniors rated D, E, and F. The curve for the central section is not shown in the figure, but would pass about midway between the other curves if drawn.

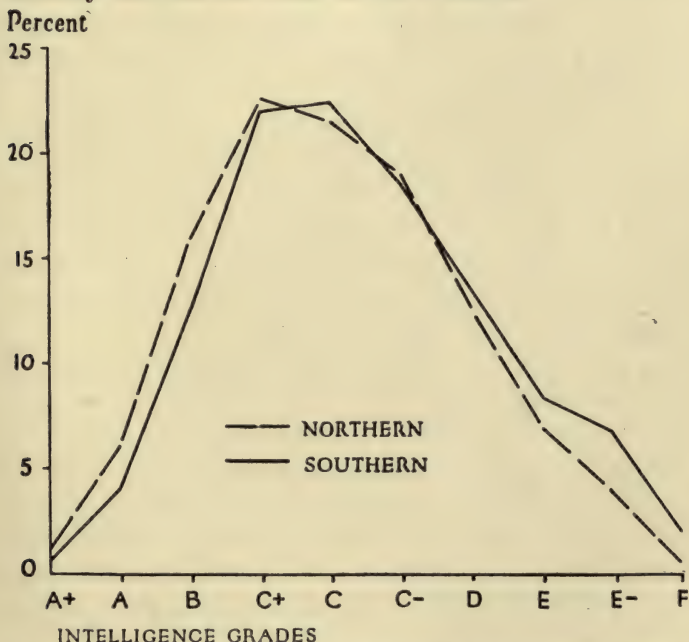


FIGURE 67. — Frequency curves for northern and southern sections of the state showing the percentage of seniors coming from each section who possess each grade of intelligence found among high school seniors.

**3. Intelligence of seniors coming from rural and city high schools.** The returns from schools drawing from 80 to 100 per cent of their students from the country (136 schools) were next compared with city schools, ranks 2, 3, and 4. The distribution of the various grades of intelligence among the senior students in these two types of schools is shown in Table XLVIII. To call attention to the rather marked difference in mental endowment possessed by the students belonging to these two types of schools located in different sections of the state, we have presented the data for the northern, central, and southern sections separately.

The 136 rural high schools contained 1194 seniors. For this comparison enough city high schools were selected at random from different sections of the state to make an equal number of seniors, care being taken to distribute them about equally through different sections of the state. There were a few more rural high schools in the central and northern than in the southern section.

A mere glance at the table will show : (1) that the rural high schools, if taken as a whole, rate decidedly lower in every section of the state ; (2) that the seniors in both types of schools rate higher for the northern than for the southern section ; (3) that the central section stands about midway between the northern and southern sections ; (4) that the rating for the rural schools in the central section is slightly higher than for the rural schools located in the northern section.

TABLE XLVIII

PER CENT OF SENIORS FROM CITY AND RURAL HIGH SCHOOLS  
SCORING AT VARIOUS INTELLIGENCE LEVELS

TYPE OF SCHOOL	PER CENT RATED					SCORING ABOVE STATE MEDIAN	MEDIAN SCORE FOR GROUP
	A+	A or B	D, E, or F	C+	C or C-		
<i>Northern Section</i>							
City . . . . .	1.31	27	17	26	30	60	141
Rural . . . . .	1.13	20	31	20	29	45	134
<i>Central Section</i>							
City . . . . .	.39	23	21	30	26	58	141
Rural . . . . .	2.41	20	29	20	31	46	135
<i>Southern Section</i>							
City . . . . .	1.10	21	23	30	26	49	136
Rural . . . . .	1.01	14	41	16	29	36	130

Combining the above results from different sections of the state, we find that the rural schools have a larger percentage of seniors making the most superior (A<sup>+</sup>) grade of intelligence, while the city schools have proportionally more seniors making a high average or C<sup>+</sup> intelligence rating. This is clearly shown in Figure 68, which indicates the percentage of seniors representing each type of community who possess each grade of intelligence (A<sup>+</sup> to F).



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The curves in Figure 69 show the intelligence scores made by different percentile groups representing the schools in each type of community and show that the range of intelligence is greater for the rural schools than it is for the city

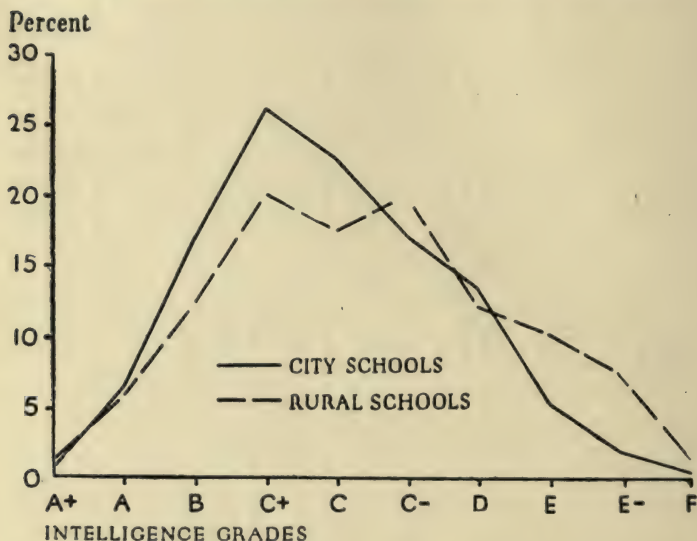


FIGURE 68. — Frequency curves for 136 rural and a representative group of city high schools showing percentage of senior class who possess each grade of intelligence.

schools. That is to say, the rural high schools have a larger percentage of seniors possessing the lower grades of ability, but they also have a larger percentage possessing the highest or A+ grade of intelligence. In other words, the rural schools contain a few more seniors who are very bright, and many more seniors who possess the most inferior grades of intelligence. This is shown in Figure 69

by the rise of the rural school curve above the curve for the city schools at the 95 and 99 percentile levels and its extension below it at the 5, 10, and 20 percentile levels.

The fact that we find a greater percentage of seniors in the strictly rural high schools of the state rated A<sup>+</sup> or over deserves special mention. Taken in connection with facts revealed in other sections of this study, it shows that

#### TEST SCORE

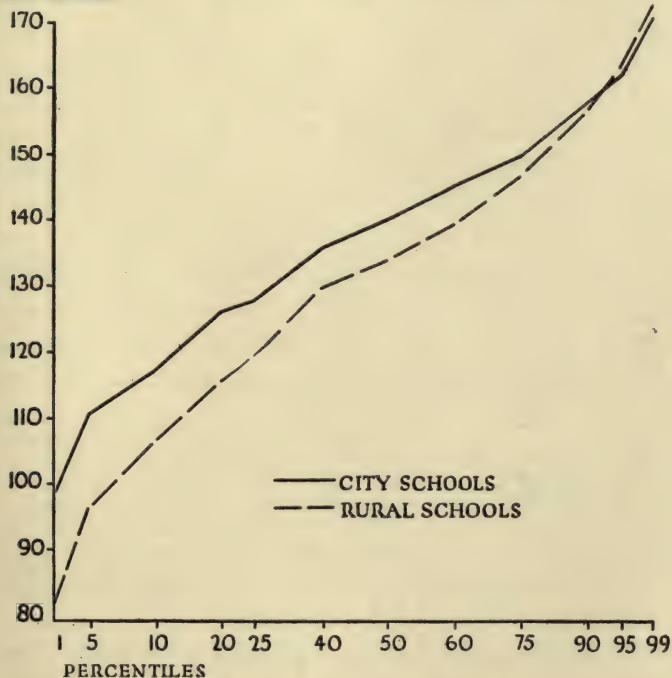


FIGURE 69. — Curves showing scores made by various percentile groups of seniors, representing the city and rural high schools of the state.

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the percentage of seniors with very superior mental ability is greater in the rural districts of the state notwithstanding the fact that the general level of intelligence in these districts is low. This fact, if properly verified by future surveys, may throw light upon the oft-debated question as to whether the brightest students in our schools and the ablest men and women come from the country or city.

4. **Intelligence of seniors coming from schools located in strictly agricultural, manufacturing, and mining communities.** The mental test scores made by seniors coming from schools located in communities where the chief industry was manufacturing were compared with the scores made by seniors representing schools located in strictly agricultural and mining communities. The results of this comparison are presented in Table XLIX and Figures 70 and 71. Table XLIX shows the percentage of seniors representing each type of community who score on the intelligence tests at the various mental levels, also the per cent belonging to the group scoring above the state median, and the median score for the group.

TABLE XLIX

PER CENT OF SENIORS REPRESENTING DIFFERENT TYPES OF COMMUNITIES SCORING AT VARIOUS INTELLIGENCE LEVELS

TYPE OF COMMUNITY	PER CENT RATED						SCORING ABOVE STATE MEDIAN	MEDIAN SCORE	CASES
	Above 175	A+	A or B	D, E, or F	C+	C or C-			
Manufacturing	.41	.82	24	17	28	31	60	141	259
Agricultural . .	.72	1.76	20	30	20	30	45	135	996
Mining . . . .	—	—	10	34	19	37	41	126	149

Figure 70 shows the percentage of seniors coming from each type of community who possess each grade of intelligence (A+ to F). The outstanding facts revealed by these curves follow :

1. The high average scores made by the seniors from the regions where the chief industry was manufacturing as

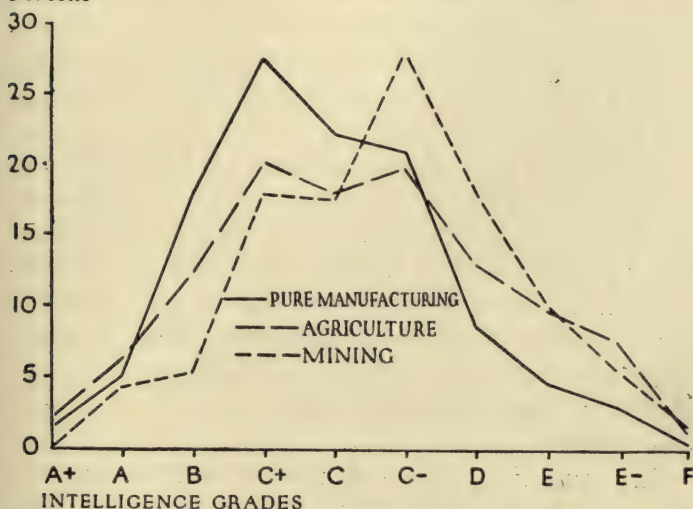


FIGURE 70. — Frequency curves for seniors coming from schools located in pure manufacturing, mining, and agricultural communities. They show the percentage of seniors who possess each grade of intelligence found among high school seniors.

compared with the low average made by the seniors from mining and agricultural districts. The curve for the manufacturing group rises above both other curves at the points indicating the B and C grades of intelligence and passes below them at the points indicating the lowest (D, E, and F) grades of intelligence.



2. The rather suprising and contrasting fact that there were, nevertheless, proportionally more seniors representing the agricultural districts who were rated A<sup>+</sup> or A than were found in either of the other groups. The percentage of individuals in these schools who possess these highest grades of intelligence was even greater than for the group of city schools which made the best all-round showing on the test. (Compare also Figure 71.)

3. The all-round low intelligence rating of the seniors coming from schools situated in the mining districts of the state.

Curves were also drawn (see Figure 71) which show the average score made on the tests by definite proportions of the seniors representing each of these types of community. These curves indicate in another way the relative standing of these community groups. It will be seen that the curve for the manufacturing group passes above both the other curves at every percentile level save the 95 and 99 percentile points, where the curve for the rural schools rises above it.

The outstanding feature of these curves is the fact that the curve for the rural schools drops so far below both other curves at the lower percentile levels and rises above them at the 95 and 99 percentile points. This shows again that while our rural high schools have a greater proportion of seniors with inferior ability than are found in either of the other types of community, they nevertheless have a greater per cent of seniors possessing the most superior grades of intelligence. The same fact was brought out in Figure 69, which shows that while the rural high schools

ranked very much below the city high schools in general level of ability, they nevertheless were superior to even the best city high schools in the proportion of seniors who possess the most superior grades of mental ability.

TEST SCORE

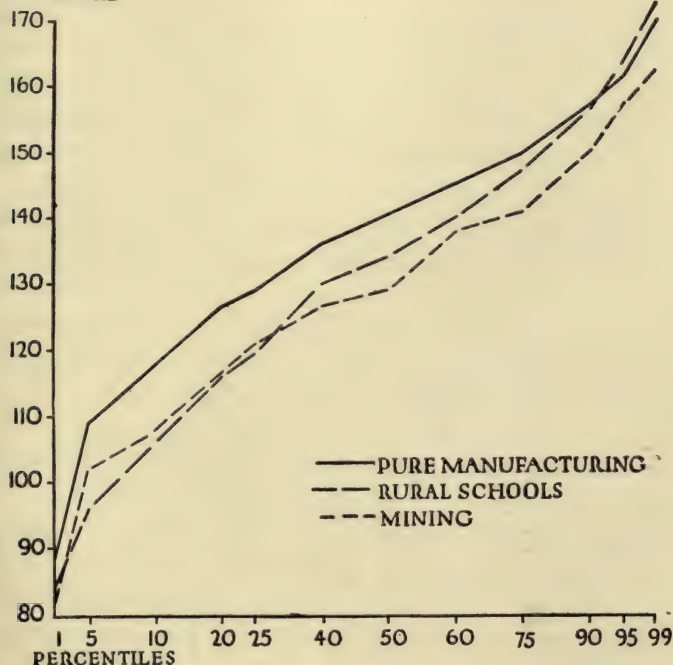


FIGURE 71. — Curves showing scores made by various percentile groups of seniors representing manufacturing, mining, and agricultural districts.

**5. Intelligence of high school seniors coming from the best and worst economic sections of the state.** From the writer's intimate knowledge of all sections of the

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state a list of county seat towns in the poorest agricultural sections was prepared, and the intelligence ratings earned by the pupils in this group of schools compared with the scores made by seniors coming from high schools located in county seat towns, of about the same size, but in the best agricultural districts of the state. Later we tabulated the returns from the schools located in the county seat towns of the 26 counties which receive state aid for the support of their schools because of the recognized poverty of these sections. The returns from all other schools in these subsidized counties were also tabulated separately and the results compared with similar schools located in the best agricultural communities. See Table L.

TABLE L

PER CENT OF SENIORS FROM SCHOOLS LOCATED IN THE BEST AND WORST ECONOMIC DISTRICTS OF THE STATE WHO SCORED AT THE VARIOUS INTELLIGENCE LEVELS

SECTIONS COMPARED	SCOR- ING ABOVE 175	PER CENT RATED					SCORING ABOVE STATE MEDIAN	MEDIAN SCORE FOR GROUP	No. CASES
		A+	A or B	D, E or F	C+	C or C-			
County seats in richest agricultural communities	.22	.74	21	24	24	30	53	138	1354
County seats in poorest agricultural communities	.63	1.27	17	33	19	30	42	133	472
In state-aided counties									
All county seat schools	.40	1.01	15	36	19	31	41	133	493
All other schools . .	—	—	15	32	19	34	42	134	322

The results of this comparison are interesting not merely because of the marked differences which they show in favor of the schools located in the better economic sections of the state but because we find a larger percentage of the students in the poorer economic districts possessing very superior mental ability than are found in the schools of the better economic sections of the state. This is true, notwithstanding the fact that the general level of ability in these county schools supported by the state is very low, and the further fact that the percentage of seniors possessing very inferior grades of mental ability is unusually high in all these regions. The median score for the state-aided counties, taken as a whole, is 5 points lower and the number of students who made scores above the state median is 11 per cent less than for the schools located in the better agricultural sections. Notwithstanding these facts, there are proportionally more seniors in the high schools of these regions who possess the highest grade of ability found among the high school seniors of the entire state.

**6. Intelligence of seniors coming from schools of the same size or rank.** Of more practical significance, however, than these community and sectional differences are the startling inequalities existing between the senior classes from individual schools, even when these schools are of the same size or rank and when located in the same county or city.

As stated in the opening paragraph of this chapter, Indiana educators have proceeded on the theory that high schools of every rank and location should measure up to the same standard of efficiency and achievement, regard-



less of the character of the pupil material with which they have to work. Our colleges and universities accept students without question or examination from all these schools if they have been commissioned. The state board of education commissions these schools upon the recommendation of the state high school inspector, who up to the present time has had no reliable method of evaluating the results which *should be obtained* in a particular high school. He has had to rely on the old and unreliable method of expecting equal results from all these schools, provided only that they are equal in material equipment and in the skill and training of their teachers. What is, perhaps, still more unreasonable and inefficient is that superintendents and teachers have been endeavoring to obtain similar results in all these schools by measuring the accomplishment of the school or the results of teaching by means of achievement tests. The following figures and data showing the marked inequalities in the native mental endowment of the pupils actually found in the various high schools of the state, will indicate how inefficient and unreasonable such practices are. To be truly efficient and just in our educational work we must adapt the work of our schools to the mental abilities and needs of our pupils, by applying in our educational practice the principle set forth by the great Teacher in his parable of the talents.

To ascertain the differences in mental capacity of the seniors representing different individual schools, we compared their test scores by the same methods used in other chapters of this report. The more important results of these comparisons are presented below.

Figure 72 shows the percentage of seniors belonging to the 12 schools ranked 3 who made an intelligence rating of A or B and D, E, and F on the mental tests. The schools were arranged alphabetically and are presented in that order. Each school is designated by a letter of the alphabet.

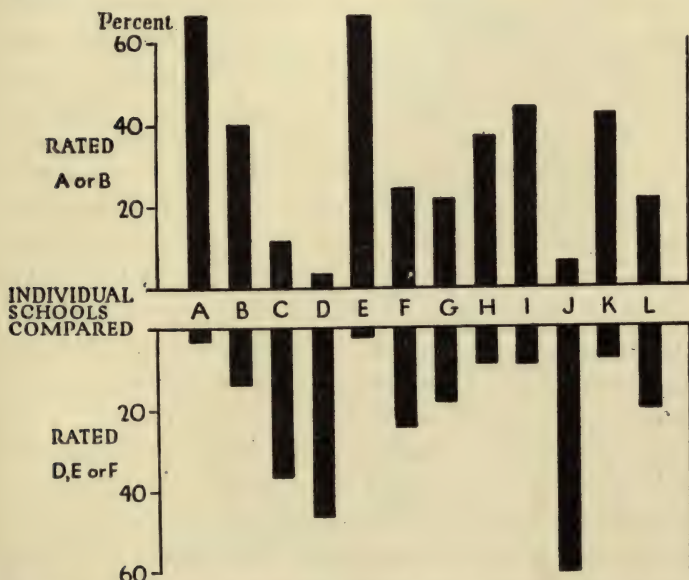


FIGURE 72. — Per cent of senior classes from all schools ranked 3, who possess the highest (A or B) and lowest (D, E, and F) grades of intelligence found among high school seniors.

Figure 73 gives a similar record for 26 schools belonging to rank 6. The 90 schools belonging to this rank were arranged in alphabetical order and the record computed for the first 26 schools of this list. Differences

equally diverse and great would appear if we had taken the last or middle 26 schools belonging to this rank, or if we had selected schools from any other rank, with one or two exceptions. The larger high schools of the state not only had proportionally fewer students rated A<sup>+</sup> or A on the tests than were found in the rural and smaller high schools, but they graduate fewer students possessing very inferior grades of ability. For this reason the variations in mental test score for the seniors belonging to the schools ranked 1 and 2 do not extend quite so far *above* and *below* the state median as is the case for the schools represented in Figures 72 and 73. The differences in the native mental endowment of the seniors representing the high schools ranked 4, 5, 7, and 8 are as varied and great as the differences shown in Figures 72 and 73, and it should be added that inequalities in native mental endowment equally great would appear if schools of equal rank from the same section of the state or from the same community had been compared. (See section 7 below.)

To give some indication of the variations in mental ability found among these same schools, we present in Tables LI and LII the median scores for each of the schools represented in Figures 72 and 73. These tables also show the per cent of seniors making scores above the state median. The proportion of seniors in each of these schools possessing average, that is to say, C<sup>+</sup>, C, or C<sup>-</sup>, intelligence may be obtained for any individual school by adding the per cent rated A or B and D, E, or F, and subtracting it from 100.

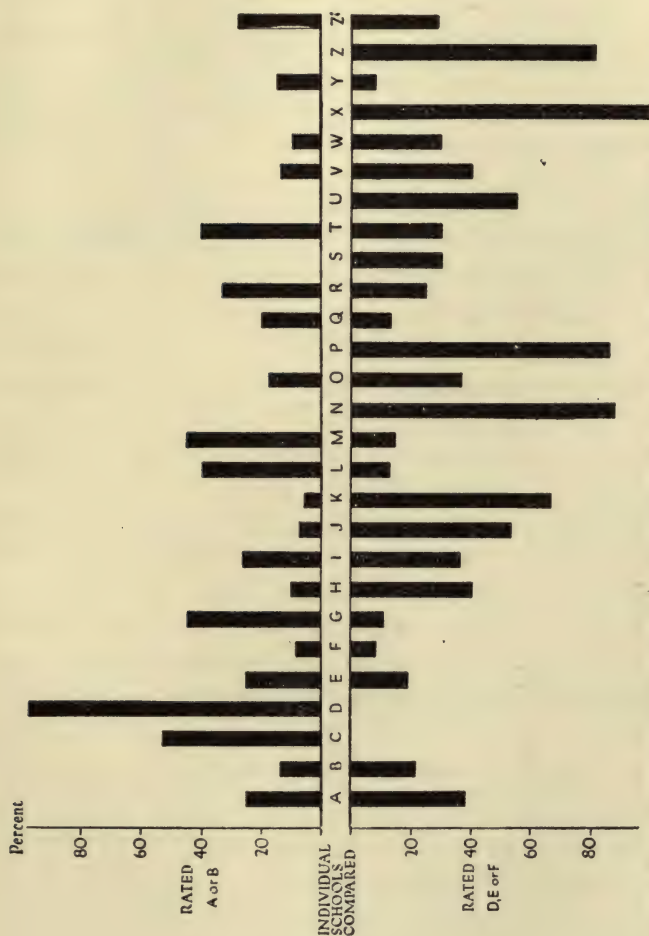


FIGURE 73. — Per cent of seniors from each of the first 26 schools ranked 6, who made an intelligence rating of A or B and D, E, or F on the mental tests.



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TABLE LI

PER CENT OF SENIORS IN ALL SCHOOLS OF THE THIRD RANK  
WHO SCORE ABOVE THE STATE MEDIAN

Individual schools	A	B	C	D	E	F	G	H	I	J	K	L
Per cent scoring above state me- dian . . . . .	90	70	38	29	91	59	68	75	73	18	74	56
Median score . . .	156	147	131	125	157	141	138	145	148	116	148	140

TABLE LII

PER CENT OF SENIORS IN FIRST TWENTY-SIX SCHOOLS OF RANK  
SIX WHO SCORE ABOVE STATE MEDIAN

Individual schools	A	B	C	D	E	F	G	H	I	J	K	L
Scoring above state median .	44	43	80	100	63	58	81	22	52	12	13	68
Median score .	133	136	151	161	140	140	148	128	138	123	118	144

Individual schools (Cont.) . .	M	N	O	P	Q	R	S	T	U	V	W	X	Y
Scoring above state median	65	60	33	—	63	65	24	70	29	35	58	—	18
Median score .	148	110	133	108	139	140	133	148	124	131	138	97	130

By marking off the 25 and 75 percentile score and showing the position which this middle group in each school holds with regard to our state standard, we get an idea of the marked differences between these individual schools when compared on the basis of central tendency. Figure 74 gives such data for all schools belonging to rank 3. Figure 75 gives similar data for the first 23 schools of

rank 6. Differences equally great and varied would appear if any other 23 schools had been selected. The schools in both figures are arranged in order of excellence, the one ranking highest being placed first, the one showing the lowest average level of mental ability, last. The letters

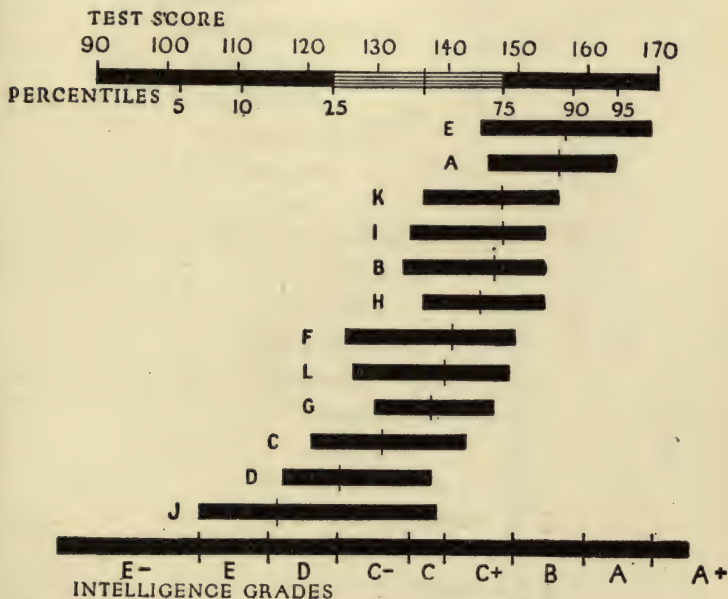


FIGURE 74. — Variations in the scores made by the middle 50 per cent of seniors belonging to the twelve schools ranked 3.

at the end of the bars are key letters representing the individual schools compared, and correspond to those used in Figures 72 and 73. The scale at the top of the figure is the state standard. The scale at the bottom indicates the variations in intelligence found among high

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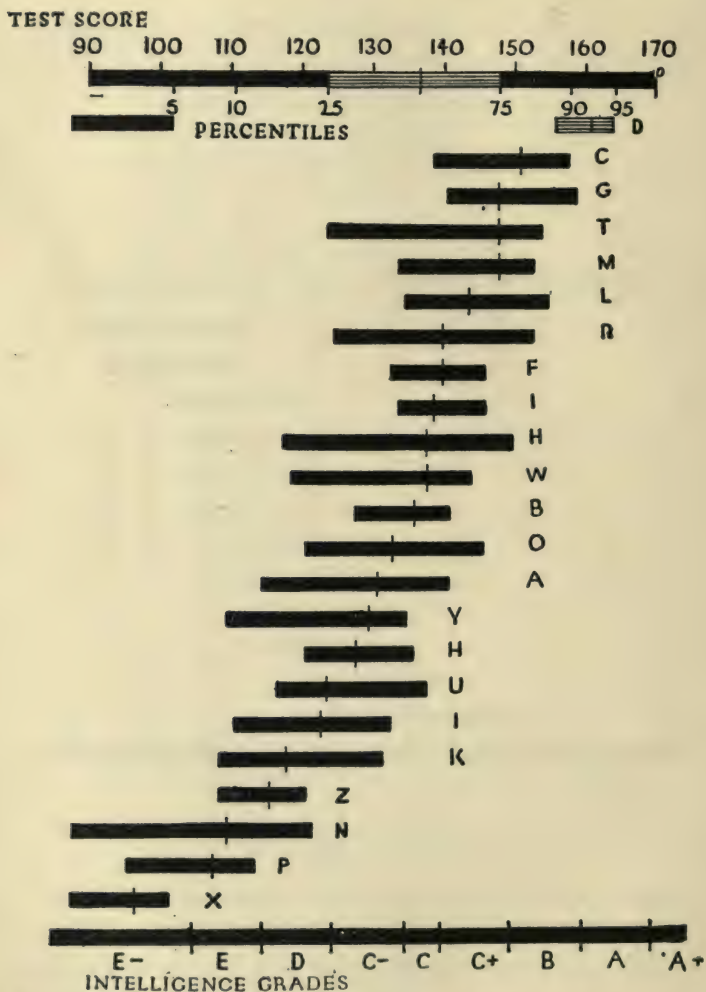


FIGURE 75. — Variations in the mental ratings of the middle 50 per cent of seniors belonging to the first 23 of the 90 schools in the state ranked 6.

school seniors. It should be remembered that these data refer to the same group of schools compared in Figures 72

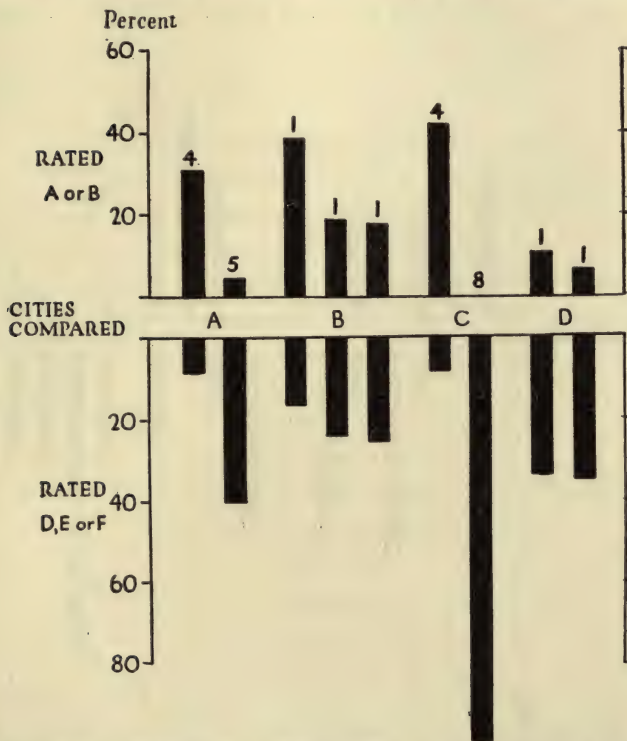


FIGURE 76. — Variations in mental ability of senior classes in high schools located in the same city. The rank or size of the schools is indicated by the figures at the top of bars for individual schools. Cities are represented by the letters A, B, C, and D.

and 73. There the proportion of superior and inferior pupils was shown. Here variations in the general level of intelligence of the senior classes is pictured.



7. Intelligence of seniors representing different individual schools located in the same city or county. Similar inequalities in the native mental endowment of

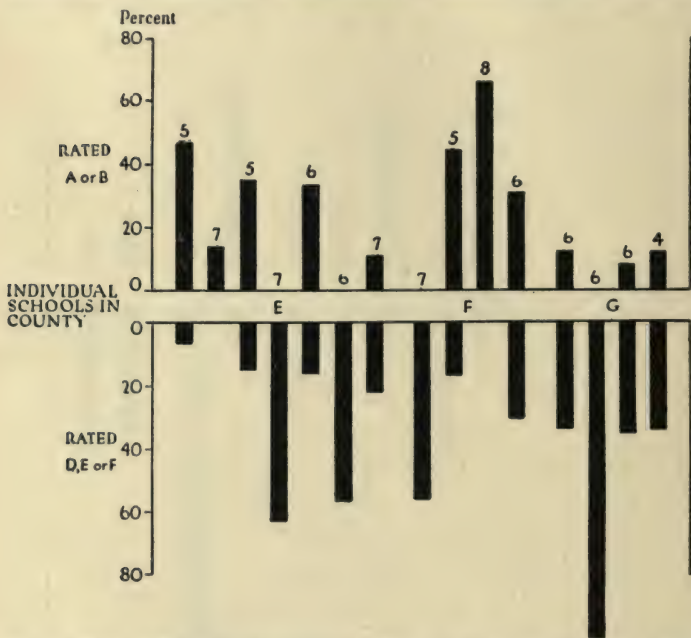


FIGURE 77. — Variations in mental ability of senior classes from high schools situated in the same county (E, F, or G). The size of each school is shown by the number placed on the vertical bars. The distance above the horizontal bar shows the per cent possessing the highest, and the distance below, the per cent possessing the lowest grades of mental ability.

high school seniors appear if we compare schools located in the same county or city. Figures 76 and 77 picture the per cent of seniors rated A or B and D, E, or F in the high schools of four different cities (A, B, C, and D) and three

counties (E, F, and G) selected at random. For each city we give results from all its high schools; for the counties we give results from all the high schools which gave the tests. The rank of each school is shown by the figure placed at the top of the bar representing the school.

Some indication of the *general level of intelligence* of the senior classes in these various schools may be obtained from the data given in Tables LIII and LIV. Table LIII shows the per cent of students in each of the city schools represented in Figure 76 who made scores on the intelligence tests above the state median · also the median score for each school.

TABLE LIII

PER' CENT OF SENIORS IN DIFFERENT HIGH SCHOOLS LOCATED  
IN THE SAME CITY SCORING ABOVE STATE MEDIAN

CITIES	A		B			C		D	
SCHOOLS	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(1)	(2)
Scoring above state median . . .	69	5	67	54	53	78	00	42	41
Median score . . .	152	134	157	146	146	155	100	143	143

Table LIV shows the per cent of seniors in the high schools of the three counties referred to in Figure 77 who made scores on the tests above the state median; also the median scores for each school.

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TABLE LIV

PER CENT OF SENIORS IN DIFFERENT HIGH SCHOOLS OF THE  
SAME COUNTY SCORING ABOVE STATE MEDIAN

COUNTIES	E							F				G			
Schools scoring above state median	1	2	3	4	5	6	7	1	2	3	4	1	2	3	4
Median score	76	66	76	00	4	83	29	11	59	100	46	40	00	18	35
	149	141	144	120	118	148	131	124	146	162	136	134	96	130	132

Figure 78 shows the record made on the intelligence tests by the middle 50 per cent of seniors belonging to each high school in these same three counties and four others. The bars show the range in score for all seniors representing the different individual schools. The counties are designated by letters. The vertical cross-bars indicate the median score for various individual schools whose rating may readily be compared with each other and with our state standard, indicated at the top of the figure.

**8. Distribution of different grades of intelligence in individual schools.** Another interesting difference is shown by the various grades of intelligence possessed by high school seniors belonging to the various individual schools of a particular county, city, or rank.

Frequency tables were made for all the individual schools used in the above comparison. These show the percentage of seniors in each school who possessed each grade of intelligence. Such data were also prepared for some 50

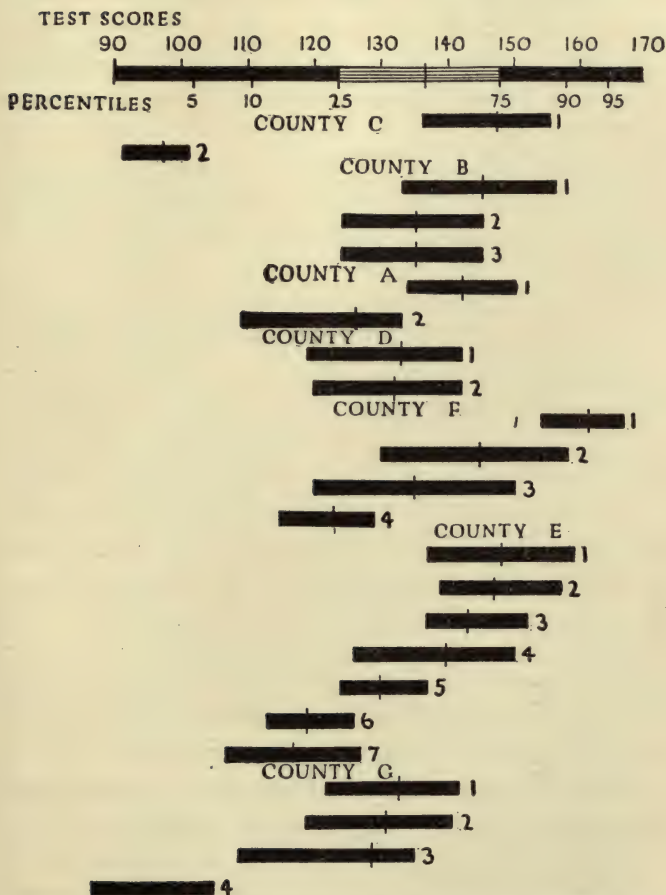


FIGURE 78.— Scores made by the middle 50 per cent of seniors representing individual schools in 7 representative counties selected at random from the 92 counties in the state. Figures at right of bars designate the individual schools.



other individual schools selected at random from our entire list and for schools belonging to the same rank. These comparisons revealed the following facts with regard to the distribution of different grades of intelligence in particular schools :

1. In some schools all members of the senior class possess a superior or very high grade of intelligence. That is to say, all members of the class will be rated A or B, or A, B, and C<sup>+</sup>.

2. In other schools all members of the senior class rank very low, none scoring above the median for the state. In a few schools the entire senior class would make scores which entitled them to only a D, E, or F intelligence rating.

3. In still other schools a large proportion of all the senior class may possess a C, or average grade of mental ability.

4. In a fourth type of school there is marked irregularity among the members of the senior class. Some individuals possess very superior mental ability. Other members of the same class will merit a ranking of E<sup>-</sup> or F. This situation is much more likely to be found in the smaller high schools. The larger high schools are better graded and seem to have eliminated all inferior students before they reach the senior year.<sup>1</sup>

5. In some schools of the latter type the various grades of intelligence will be found normally distributed.

6. Many schools in all sections of the state and of all ranks occupy various positions between these extremes.

<sup>1</sup>There is some evidence in our data that they may have also eliminated those with the most superior grade of intelligence. No individuals scoring in the highest one percentile group were found in the larger high schools of the state.

Most of these facts are graphically presented in Figure 79, which shows the intelligence ratings obtained by the seniors in a number of different schools, selected at random

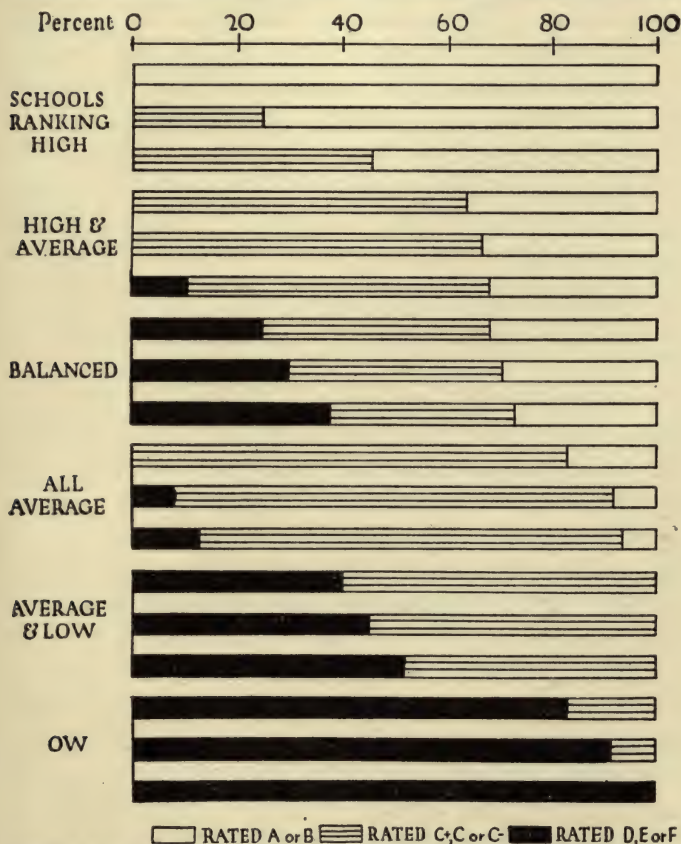


FIGURE 79. — Variations in mental strength of the senior classes in various individual high schools shown by the markings on the horizontal bars which indicate the percentage of seniors in each type of school who possess different grades of intelligence.

from rank 6 and arranged to show these variations in intelligence in individual schools.

**9. Geographical distribution of the most intelligent high school seniors found in the state.** As stated in the introductory chapter of this report, our primary purpose in making this investigation was to locate by means of reliable intelligence tests the most capable boys and girls graduating from the high schools of the state, in order that they might be encouraged and, if need be, helped financially to continue their education in college. For this purpose we have considered those whose mental test scores place them in the highest 1 and 2 percentile groups for the entire state as such superior individuals.

It must, however, not be assumed that group intelligence tests can be used as an instrument for making detailed individual diagnoses. Such tests are most useful for the separation of large groups of individuals into sections representing various grades of mental ability. They are most reliable for differentiating the bright or very bright members of such groups from those with lower grades of intelligence.

When an individual diagnosis is desired, the results of a group intelligence test should be supplemented with teachers' estimates of native mental ability, school success, and, better still, with the results of an individual mental examination which naturally can be made more refined, inclusive, and exact. For various reasons a particular individual may not do himself justice on a group intelligence test and so may make a score indicating a grade of

intelligence far below that which he actually possesses. But when an individual makes a rating on a reliable group intelligence scale which places him in the highest 1 or 2 percentile group for an entire state, we have evidence which shows fairly conclusively that he possesses a very superior grade of intelligence.

It was our purpose to locate these highly gifted individuals, so that their special capacities and talents might be conserved by giving them the special training and guidance which their superior mental ability warrants.

Individuals possessing this superior grade of intelligence were found in every section of the state; in every type of high school from the smallest, ranked 8, to the largest, where the graduating class numbered several hundred. But they were not found in equal proportions or in the senior classes of every school. These superior individuals come from every section and every type of community in the state, — rural, manufacturing, and urban; they represent every occupational class and all economic strata except the wealthiest group, which had no representatives in this most superior class; they come from the smallest and most poorly equipped high schools; they were often retarded by the school and in general only regularly promoted. No special provision seems to have been made by any of the high schools to locate them or to administer to them in accordance with their intellectual capacities and special needs. In fact there is considerable evidence in our data that their special abilities are often smothered or wasted because the work of the school has not been adapted to their mental strength nor results demanded in proportion



to their abilities. They seem to be able to survive and thrive better in the smaller and moderate-sized high schools.

The geographical distribution of these specially endowed

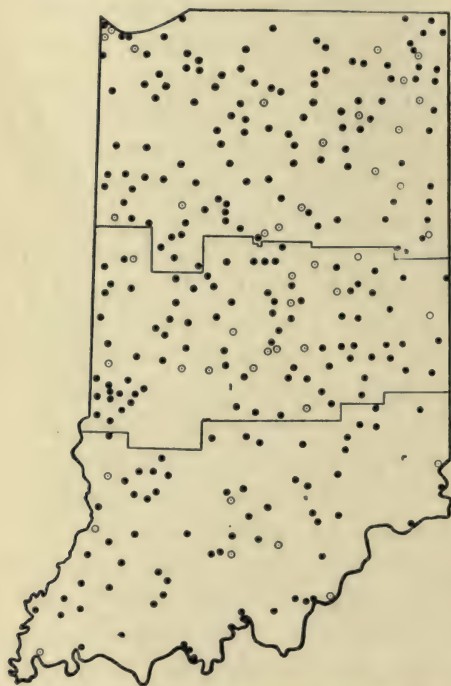


FIGURE 80. — Map of Indiana showing geographical distribution of the brightest seniors (white circles) and location of all high schools (black dots) which gave the intelligence tests.

individuals for the school year 1918-1919 is shown by the light circles on the accompanying map (Figure 80), which shows also (the black dots on the map) the location of all the high schools which gave the intelligence tests.

**10. General summary and discussion of results.** The more important facts revealed by the comparisons made in this chapter may be summarized under the follow-

ing heads: (a) community and sectional differences; (b) differences between individual schools.

(a) *Community and sectional differences.* The inequal-

ities in mental strength of the senior classes representing different sections and types of community may be briefly stated as follows :

1. The seniors from the schools in the northern section of the state made a better showing on the tests than did those from the central. Those from the central section ranked higher than did those from the southern. This is true whether the schools are considered as a whole or by ranks and the superiority holds whether we compare them on the basis of central tendency or on the basis of the percentage who possess the highest and lowest grades of mental ability found among high school seniors. Considering the regions as a whole, the northern section of the state is superior to the central and the central to the southern.

2. The seniors from the urban centers of the state and from the smaller city high schools ranked higher on the tests than did the seniors from rural high schools. The average level of intelligence of the group was higher for city schools and the frequency curves show that the city schools contain a larger percentage of seniors possessing the higher intelligence grades and a smaller percentage possessing the lowest. But there are proportionately more seniors in the rural high schools who possess the highest grade of intelligence found among the seniors of the entire state. These results suggest that while the better stock of the state is congregating in the cities and is engaging in manufacturing, business, and professional pursuits rather than in agricultural, more individuals with exceptionally good mental ability are found in the country.

3. Comparing the intelligence of the seniors coming

from the purely manufacturing, agricultural, and mining communities of the state, we find the manufacturing districts superior to the agricultural, and the agricultural superior to the mining. This holds whether we compare the seniors from these communities on the basis of general level of intelligence or on the basis of the range of intelligence for each group, or the various grades of mental ability found within the group. There are proportionately more seniors in the manufacturing communities rated A or B than in the agricultural and mining communities, and a smaller percentage possessing the lowest grades of intelligence. But the agricultural communities have more than twice as large a percentage of seniors who rank in the highest 1 percentile class. The mining communities have no representatives in this class and only half as many rated A or B as are found in the agricultural and manufacturing communities.

4. When we compare the schools in the best and worst economic districts of the state, we find a proportionately larger number who possess the higher grades of intelligence coming from the schools in the richer counties than are found in the poorer economic districts. That is, the seniors in the schools of the former districts rank higher in median score and have a larger percentage of individuals rated A or B on the tests. But the schools in the poorer districts have a decidedly larger proportion of seniors possessing the highest grade of intelligence. Proportionately twice as many students from these poorer districts belong in the highest one percentile group as were found among the seniors coming from the wealthier counties. But the proportion of seniors with superior and

high average intelligence is much less and the percentage possessing the lowest grades of intelligence is relatively high in the less productive communities of the state.

(b) *Differences between individual schools.* Comparing the mental strength of the senior classes in schools of different sizes or ranks and in individual schools of the same size or rank, but located in the same county or city or in different sections of the state, we found the following marked differences between them.

1. The senior classes from schools of moderate size (ranked 2, 3, and 4) possess, on the whole, the ablest seniors. Taken as a group they not only rank higher on the mental tests than the representatives of any other groups, but contain a larger percentage of seniors possessing the highest grades of intelligence, and the smallest percentage of seniors possessing the lowest grades of intelligence found in the total group. Notwithstanding this fact, all ranks or types of high schools have representatives in this highest intelligence group regardless of their geographic and economic situation. The smaller high schools have the largest percentage of seniors possessing the lowest grades of intelligence found among our standard group. Their senior classes also show the widest ranges of intelligence. But they rank very high in the percentage of seniors who make the highest intelligence grade. The range of intelligence in the largest high schools is relatively small, suggesting that both the brightest and dullest seniors have been eliminated before the senior year.<sup>1</sup>

<sup>1</sup> One would at first thought be inclined to explain this result on the hypothesis that the tests were not so carefully given or that the results



2. The most striking and significant results revealed by the comparisons made between the intelligence ratings of seniors coming from different communities and schools was the marked inequalities in mental capacity which were shown between the senior classes from schools of the same rank even when located in the same community or city. Considering the schools of any rank as a class or group, we found individual schools in this group where all members of its senior class made scores on the mental tests which entitled them to an A or B intelligence ranking. Other schools of the same rank had no senior making an intelligence grade higher than C- and occasionally a school where all seniors made an intelligence rating of D, E, or F. Other schools ranked at various levels in between these extremes and the inequalities hold whether we compare the schools on the basis of median score or on the basis of the per cent making the highest or lowest grades of intelligence. For example, among the first 26 schools of rank 6, arranged alphabetically, we find one school where 100 per cent of its seniors scored above the state median and another school where all its senior class scored below the state median. The median score for the first school

were inaccurately scored in the smaller schools. But this is impossible because all the test papers from these schools were rescored in the laboratory. The fact that so many pupils made such low records in these schools rather seems to indicate that instructions were followed in these schools as well as in the larger schools. In fact this point was tested by comparing the scores on the odd and even tests. This was done for a group of these smaller schools and showed the usual correlation, demonstrating that the tests had been consistently and carefully given. This method also gave us a check on the general reliability of all our results and proved to our satisfaction that the tests were carefully and uniformly given.

was 161; for the second 108. In rank 3 we find a variation almost as great. In school E, 91 per cent of the senior class made scores above the state median with a median score of 157. School G had only 18 per cent scoring above the state median with a median score of 116. Ranks 4, 5, 7, and 8 show variations equally great. But such marked differences were not found among the larger schools or among the schools showing a wide range of intelligence grades.

3. Inequalities equally striking appear if we compare individual schools located in the same city. In city A (compare Table LIII and Figure 76) the median score for one of its high schools was 152; for the other 134. In the former, 69 per cent of the senior class scored above the state median; in the latter, only 5 per cent. In city C, high school number 1 had 78 per cent of its seniors scoring above the state median; its median score was 155. School number 2 had no seniors scoring above the state median and the median score was only 100 points.<sup>1</sup> City B had three high schools; numbers 2 and 3 are almost identical if we compare the mental strength of their senior classes. The median score for each was 146. The per cent scoring above the state median was 54 and 53. But school number 1 in this same city had 67 per cent of its seniors scoring above the state median with a median score for the class of 157. School number 2 had the highest percentage of seniors making the highest intelligence rating (A). (Compare Table LIII above.)

<sup>1</sup> School number 2 in city C was a colored high school. The other schools used in these comparisons are not only all white high schools, but all belong to the same rank.

4. Inequalities equally striking appear if we compare the mental capacity of the senior classes in individual schools located in the same county. (See Table LIV and Figure 78 above.)

5. The more important facts pertaining to the grades of intelligence possessed by the senior classes in the different high schools and the range in mental ability which they show have been concisely stated in section 8 above. It needs only to be added that there are marked and significant differences in these respects. Some senior classes are uniformly bright; others are uniformly dull. Some classes are *very* uneven, showing a wide range in mental ability. Most schools occupy positions between these extremes.

(c) *Discussion.* The practical significance of these marked differences between sections, communities, and individual schools needs only to be pointed out to be appreciated. The inequalities in mental capacity of classes, schools, or pupils in different buildings of the same school system, or schools located in different sections and communities of a state, should be taken into account in evaluating the scholastic accomplishment of any class or school. No teacher's work should be judged except in relation to the native mental capacity of the raw material with which she must deal.

The *exact* amounts of the differences shown in this chapter should not be emphasized, as our method for obtaining them was somewhat crude. Some allowance should also be made, perhaps, for the fact that the tests were given by so many different individuals. But that

our results demonstrate the existence of such class, community, sectional, and school differences cannot be denied. Such inaccuracies as may be found in the results presented in this chapter might easily be avoided by any city or county superintendent wishing to make a mental survey of all his schools, merely by having *one person* give all the tests and by exercising special care to secure uniform procedure.

Such class and community differences as we have described should also be taken into account in evaluating the product of these high schools for admission to college. Our results show that the most superior individuals may be picked up in the smallest and most poorly equipped high schools of the state, and that there are great variations in the native mental endowment of the seniors graduating from the same school. A college might also well look to certain sections of the state for its chief supply of students. Moreover, if the colleges are to obtain and train the ablest seniors in the state, they must invent some method of selection better than that of judging them by their past scholastic attainment. As was shown in Chapter IV the best mentally endowed young people in the state may not even apply for admission to college. They may not even be graduating from high school. Furthermore, mere scholastic attainment is no guarantee of superior mental ability. It may be attained in normal time by an individual of only average ability or less, while the genius, because the work of the high school is ill-adapted to his mental capacities or intellectual needs, will often make only an average showing in his high school work, sometimes not even that.



The importance of the mental survey as a means for locating the best mentally endowed pupils in our schools and as an aid for conserving their special abilities to the state is beginning to be recognized. It provides a practical and reliable method for their selection which constitutes the first necessary step in the process of educating them in accordance with their mental ability and needs. It may also be used as a means for directing them towards the work in life which they should undertake. It may, therefore, be used in the solution of some of the most perplexing social and educational problems which confront the world to-day and so become one of the means for conserving and cultivating the full capacities and talents of all the people of the state.

## CHAPTER XIII

### INTELLIGENCE OF SENIOR BOYS AND GIRLS COMPARED

IF the mental capacities and special abilities of high school seniors are to be fully conserved by wiser educational and vocational guidance, and by the adaptation of educational opportunities to individual needs, the question of sex differences takes on new and special significance. As stated in the introductory chapter, the intelligence scores made by the boys and girls were kept separate in all our comparisons, in order that a study might be made of all sex differences revealed throughout the investigation.

Many of the important sex differences shown by our comparison of the various senior groups have already been presented in previous chapters. These results will, therefore, be only briefly summarized here, and presented, with other pertinent facts bearing on the following problems: (1) differences in native mental endowment; (2) differences in college intention; (3) differences in school success; (4) differences in vocational interest; (5) differences in scholastic interest; (6) differences between the boys and girls representing different economic and occupational groups; and (7) differences between the intelligence of senior boys and girls coming from different communities and schools.

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1. **Differences in native mental endowment.** Of the 5748 seniors used in the various comparisons made in this investigation, 60 per cent (59.9 per cent) were girls and 40 per cent (40.1 per cent) boys. This gave us a third more girls than boys for our comparative study of the sexes. It is therefore evident that more girls than boys are graduating from the high schools of the state and that the differences in mental ability found cannot be taken as typical of actual differences in the mental capacity of the sexes. The sex differences in general intelligence shown in this study are, however, important.

It should be stated at the outset that in every comparison of the intelligence scores made throughout the entire study, the record made by the boys was superior to that made by the girls. The amount of this difference may be computed from the median scores for each group, and from the record made by the middle 50 per cent of individuals belonging to each sex. The median score for the boys was 138.9 points; for the girls 135.8. The range in score for the middle 50 per cent was 126 to 150 points for the boys, and 123 to 147 for the girls. The boys were also superior at every intelligence level, as is shown by the different percentile scores given below.

TEST SCORE MADE BY	PERCENTILE GROUPS								
	1	5	10	25	50	75	90	95	99
Boys . . .	80	102	112	126	139	150	160	165	177
Girls . . .	83	102	111	123	136	147	157	163	175

Other differences in the mental ability of the sexes are shown by the per cent belonging to each sex who made scores above the state median, viz. 53.74 per cent for the boys and 47.48 per cent for the girls. The best indication of the comparative mental strength of the sexes is the per cent of boys making scores above the median score for the girls. This was 56.2 per cent, while only 41.4 per cent of the girls made scores above the median score for the boys. If we make a similar comparison for other proportionate groups of boys and girls, we find that the superiority of the boys holds for all regions of the distribution. This is seen by the data contained in the following percentile table, showing the per cent of boys and girls who scored above and below various percentile groups of the opposite sex.

TABLE LV

PER CENT OF BOYS AND GIRLS SCORING ABOVE AND BELOW  
VARIOUS PERCENTILE GROUPS OF THE OPPOSITE SEX

GROUPS	ABOVE GIRLS			BELOW GIRLS		
	90 Percentile	75 Percentile	Median	25 Percentile	10 Percentile	Median
Boys . .	14	31 <i>Above Boys</i>	56.2	21	9 <i>Below Boys</i>	43.8
Girls . .	7	20	41.4	32	11	58.6

The frequency curves for the boys and girls are given in Figure 81. The curve for the boys rises above that for the girls at all points indicating the higher grades of intelligence, and passes below it at all points indicating the



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lowest grades of intelligence. That is to say, a larger percentage of boys than girls make these higher ratings on the intelligence tests, and a smaller percentage of boys make the lower ratings obtained by our total or standard group.

A more significant question, however, is the range of

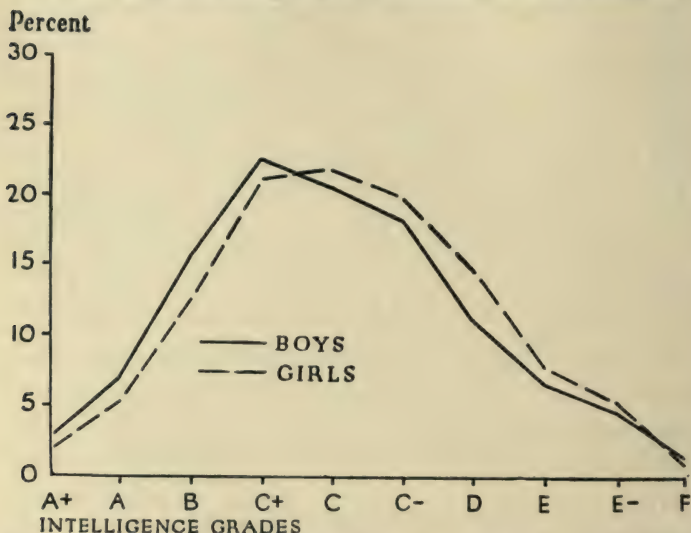


FIGURE 81. — Frequency curves showing the percentage of boys and girls making each grade of intelligence found among high school seniors.

intelligence shown by each sex. This is indicated by the percentage of boys and girls who made the highest grades (A or B) and the lowest grades of intelligence (D, E, or F). Of our total group of boys, 25 per cent were rated A or B, while only 20 per cent of the girls made this rating. Twenty-three and eight-tenths per cent of the boys made

an intelligence rating of D, E, or F, as opposed to 28.4 per cent for the girls.

Carrying these comparisons still farther to the groups rated A or A<sup>+</sup> we find that the higher in the scale of intelligence we go the greater is the percentage of boys. There were proportionately twice as many boys as girls who made intelligence scores above 180. There were also more girls than boys making an intelligence grade of D or E, but the percentage of boys making the lowest intelligence grade made by high school seniors (F) was slightly higher for the boys than for the girls—1.34 and 1.16. But the range of intelligence extends lower in the scale for the girls than for the boys. The duller girls seem better able to survive in high school than the boys and to succeed with their work where boys with equal mental ability fail.

**2. Differences in college intention.** Of our total group of seniors, 74 per cent of the boys and 63 per cent of the girls were planning to go to college. Most of the boys going to college (56 per cent) had definitely selected the college they expected to attend. Of these 37 per cent chose a technical or professional school, while 19 per cent selected a college of liberal arts; 44 per cent had not decided what college to attend. Among the girls going to college 29 per cent selected a college of liberal arts; 3 per cent selected a professional or technical college, but 68 per cent had not selected the college they would attend.

The general superiority of the boys over the girls is shown by the fact that no matter what groups we compare—those going to college, those not going, those going to

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colleges of liberal arts, those selecting a technical school, or the group which had not selected the college they expected to attend — the boys in each group make consistently higher scores on the intelligence tests than do the girls. This is true on whatever basis we compare them, *i.e.*



FIGURE 82. — Frequency curves showing percentage of boys and girls going to college who possess each grade of intelligence (A+ to F) found among high school seniors.

central tendency or percentage possessing the highest and lowest intelligence scores.

The frequency curves for the boys belonging to each of the above-named groups pass above those for the girls at all points indicating the higher grades of intelligence and below them at all points indicating the lower grades of

intelligence, as is shown in the two sets of curves given in Figures 82 and 83. The same facts are brought out in Figure 7, Chapter IV, which shows the percentage of boys and girls belonging to each group who made the highest (A or B) and lowest (D, E, or F) intelligence ratings made by any seniors in the state. We may therefore conclude

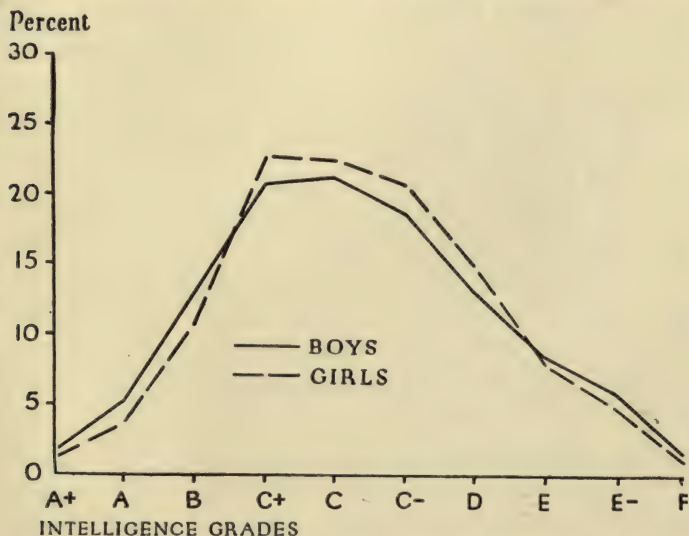


FIGURE 83. — Frequency curves showing the percentage of boys and girls *not* going to college who possess each grade of intelligence (A+ to F) found among high school seniors.

that all the facts about the intelligence of seniors going to college, presented in Chapter IV, hold, regardless of sex, namely: The brightest seniors are going to colleges of liberal arts. Those going to college rank, in intelligence, slightly above those not expecting to attend. But 22



per cent of the brightest boys and girls in the state are not even planning to continue their education beyond the high school. Yet 65 per cent of the boys and girls possessing the lowest grades of intelligence found among high school seniors are going to college in ever increasing numbers. (Compare Chapter IV.)

**3. Differences in school success.** The most interesting and significant sex differences revealed by the survey are shown by a comparison of the intelligence scores and standing in their school work. The scholastic record which each senior had made in his high school work is shown in two ways:

(a) By the average school marks obtained in the various subjects studied in high school.

(b) By the way each senior was advanced during his high school and elementary school course. This is shown by the number of times he was accelerated, regularly promoted, or retarded during his school career.

(a) *Scholastic rating of the sexes compared.* Our comparative study of the school marks made by the boys and girls shows that the girls were consistently rated higher in their high school work than the boys, notwithstanding the fact that the boys belonging to every scholastic group make higher scores on the intelligence tests. Table LVI giving the per cent of boys and girls who obtained various scholastic ratings compares the sexes on this point, and shows that a larger percentage of girls than boys were rated excellent and high on their high school work, and a smaller percentage were rated medium and fair.

TABLE LVI

PER CENT OF BOYS AND GIRLS OBTAINING VARIOUS SCHOLASTIC RATINGS ON THEIR HIGH SCHOOL WORK

SCHOLASTIC RATING	EXCELLENT (95-100%)	HIGH (90-94%)	GOOD (85-89%)	MEDIUM (80-84%)	FAIR (75-79%)	POOR (60-74%)
Boys	5	20	30	27	17	.84
Girls	8	27	29	23	11	1.66

Table LVII shows the percentage of boys and girls belonging to each of these scholastic groups who made the highest (A or B) and lowest (D, E, or F) intelligence grades on the mental tests. The boys rank consistently higher than the girls. But notwithstanding this fact the girls are marked higher on their school work, as indicated in Table LVI.

TABLE LVII

PER CENT OF BOYS AND GIRLS BELONGING TO VARIOUS SCHOLASTIC GROUPS WHO POSSESSED THE HIGHEST AND LOWEST GRADES OF INTELLIGENCE

SCHOLASTIC GROUPS COMPARED	INTELLIGENCE RATINGS					
	A or B		D, E, or F		C	
	Boys	Girls	Boys	Girls	Boys	Girls
<i>Rated</i>						
Excellent . . . . .	48	42	8	11	44	47
High . . . . .	33	25	14	21	53	54
Good . . . . .	24	16	22	28	54	56
Medium . . . . .	19	13	30	37	51	50
Fair . . . . .	12	9	36	41	52	50
Poor . . . . .	3	4	52	45	45	57

The same fact was emphasized by our frequency tables and curves prepared for the boys and girls belonging to the various scholastic groups. The curves for the boys belonging to each scholastic group pass consistently above the curves for the girls at all points indicating the higher grades of intelligence (A, B, and C+) and fall below them at all points indicating the lower grades.

(b) *Acceleration and retardation.* If we measure the school success of our total group of senior boys and girls by the number of times they were accelerated, retarded, or regularly promoted during their school career, we find that more girls than boys have been accelerated and fewer retarded in both the high school and elementary school. About the same percentage of boys and girls were regularly promoted. (Compare Tables IV and VI in Chapter V, page 49.) Yet the boys made higher scores on the intelligence tests than did the girls belonging to similar groups. This was true regardless of where the acceleration or retardation took place, and regardless of the amount of acceleration or retardation that occurred.

The fact that the boys make consistently higher ratings on the intelligence tests is clearly shown by the median scores for the several semester- and age-groups given in Table LVIII on following page.

The same fact was brought out when the records made by the middle 50 per cent of boys and girls belonging to each of these semester- and age-groups were compared. (See Figures 18 and 19, Chapter V.) These showed the per cent of boys and girls belonging to each of these groups rated A or B and D, E, or F. (See Figures 20 and 21,

TABLE LVIII

MEDIAN SCORE FOR THE BOYS AND GIRLS ACCELERATED AND RETARDED BY THE SCHOOL

GRADUATING AT AGE OF	MEDIAN SCORE FOR		GRADUATING IN SEMESTERS	MEDIAN SCORE FOR	
	Boys	Girls		Boys	Girls
15.....	151	150	6.....	151	143
16.....	148	144	7.....	143	141
17.....	143	140	8.....	139	135
18.....	139	135	9.....	138	134
19.....	131	122	10.....	137	119
20.....	129	122			
20-27.....	124	123			

Chapter V.) The frequency curves for the various accelerated and retarded groups indicated the same thing. The curves for the boys who were accelerated and retarded rise regularly above the curves for the girls at all points indicating the higher grades of intelligence and drop below them at the points indicating the lowest grades of intelligence. (Compare Figures 22 and 23, Chapter V.) The following conclusions may be drawn from this study of sex differences in school success :

(1) The senior boys who took the intelligence tests are brighter than the girls, but the girls are nevertheless given higher school marks and are more rapidly and regularly promoted by the school.

(2) Of the boys accelerated in high school, twice as many made an intelligence rating of A or B as did the girls similarly accelerated. Many girls with inferior intelligence



ratings have been accelerated in high school. Of the girls graduating from high school in three years about 12 per cent make an intelligence rating of D, E, or F on the mental tests. Among the boys completing their high school course in the same time only about 4 per cent fall so low on the mental tests.

(3) The boys retarded by the high school are much brighter than the girls who fail of promotion. Of the boys requiring ten or more semesters to graduate, 21 per cent made an intelligence rating of A or B. No retarded girls made so high an intelligence rating on the tests. If a girl is retarded in high school, we may assume on the basis of our test results that she probably possesses inferior intelligence. In fact, 58 per cent of the girls retarded in high school make the lowest grades of intelligence. But many girls with inferior ability have been accelerated by the high schools of the state.

These facts seem to show either that the girls who have the ability to succeed with their school work are more likely to apply themselves than is the case for the boys, or that the course of study and work of the high school somehow favors the girls.

**4. Sex differences in vocational interest.** A few more boys (64 per cent) than girls (60 per cent) stated that they had chosen their vocation in life. The largest percentage of boys chose engineering (31 per cent), farming (25 per cent), a skilled trade (13 per cent), business (12 per cent), teaching (5 per cent), law (5 per cent), medicine (4 per cent). The largest percentage of girls selected teaching (47 per cent), clerical work (34 per cent),

music and art (7 per cent), and nursing (5 per cent). Only sixteen different lines of work were chosen by both sexes, fourteen by each sex.

Comparing the intelligence scores made by the group of boys who selected a vocation in life with the scores made by the group who had not, we find that the former group is only a little superior in intelligence to the latter. But the boys belonging to both groups make a better record on the mental tests than the girls belonging to the same groups. There is, however, a marked difference in the intelligence of the boys and girls choosing different occupations.

The boys choosing science, the ministry, and journalism, if taken as a group, rank highest on the intelligence tests. Those selecting medicine, business, and farming rank lowest. Those electing law, engineering, and teaching rank in between these other groups. The girls selecting journalism, social service, and law, taken as a group, rank above all others. The girls selecting clerical work and nursing rank lowest on the intelligence tests. The groups electing teaching and medicine rank in between these other groups. The relative positions of all these occupational groups remain the same whether they are compared on the basis of central tendency or percentage belonging to the group who possess the highest and lowest grades of intelligence.

The brightest senior boys chose science and engineering, the dullest boys chose farming. Those selecting certain professions, notably medicine, possess only average mental ability for high school seniors and were on a par mentally with the group selecting a skilled trade.

One of the characteristic features of these occupational

groups is the wide range in intelligence shown by the individuals choosing the same line of work. A certain occupational group, taken as a whole, might average very low, yet individual seniors would select that occupation who possessed the highest grades of intelligence. This is true for both the girls and boys. Occupational choice seems to take place quite irrespective of a knowledge of the mental capacity or strength that is required to succeed in the occupation selected. For example, some of the brightest senior girls in the state select stenography. The general level of intelligence of the girls selecting this occupation is the lowest of all occupational groups. The dullest senior girls in the state chose teaching as their life occupation, and similar inequalities were found among the boys selecting the same occupation. In some of these occupations there is opportunity for the exercise of exceptional mental qualities. Other occupations chosen by the brightest seniors clearly require only an average or an inferior grade of mental ability to succeed. Such occupations are nevertheless indiscriminately chosen by the brightest boys and girls. The dullest seniors in the state are, on the other hand, selecting such occupations as teaching, nursing, and medicine in large numbers, occupations which clearly demand the exercise of the best mental powers to be found among the young people of the entire state.

**5. Sex differences in scholastic interest.** The scholastic interests of the sexes may be inferred in part from the high school courses which the boys and girls elect, but chiefly from the favorite high school subjects chosen by each sex. The percentage of boys and girls

who were completing each type of high school course is as follows:

TABLE LIX

PER CENT OF SENIORS COMPLETING EACH TYPE OF  
HIGH SCHOOL COURSE

COURSES	GEN- ERAL	ACADEMIC	COMMERCIAL	COLLEGE PREPARA- TORY	VOCA- TIONAL	CLAS- SICAL	SCIENTIFIC
Boys	52	35	4	4	1.73	1.78	1.30
Girls	53	31	8	3	2.15	2.03	.32

The boys graduating from each of these courses rank higher on the intelligence tests than do the girls. This holds true whether the sexes are compared on the basis of central tendency or on the basis of the percentage belonging to the group who possess the higher and lower grades of mental ability. The percentage of boys and girls belonging to each course-group who made an A or B intelligence grade on the test is as follows:

HIGH SCHOOL COURSE	GEN- ERAL	ACA- DEMIC	COM- MERCIAL	COL- LEGE PREPAR- ATORY	VOCA- TIONAL	CLAS- SICAL	SCIEN- TIFIC
Boys . . . .	23	28	19	22	18	34	27
Girls . . . .	19	22	15	14	15	26	23

It should also be pointed out that a larger percentage of the girls belonging to each of these course-groups are rated D, E, or F. The scientific, college preparatory, and academic courses send the largest percentage of boys to



college; the classical, scientific, and general course send the greatest percentage of girls to college.

A mere glance at Table LIX will show that a larger percentage of girls than boys selected a commercial, vocational, and classical course in high school, while proportionately more boys than girls selected the academic and scientific courses.

Of more significance, however, is the percentage of boys and girls who choose particular subjects as their favorite study in high school. The favorite studies of the boys, named in order of preference, are science (30 per cent), mathematics (28 per cent), and history (15 per cent). The favorite studies of the girls are English (29 per cent), mathematics (17 per cent), commercial subjects (13 per cent), foreign language and history (each 11 per cent). The complete scholastic preferences for both sexes are shown in Table LX.

TABLE LX

FAVORITE STUDY	MATHEMATICS	ENGLISH	HISTORY	SCIENCE	PHYSICS	CHEMISTRY	LANGUAGE	LATIN
Boys	28	7	15	11	13.6	5.21	.86	1.77
Girls	17	29	11	4	.72	.87	6.63	4.71

FAVORITE STUDY	COMMERCIAL SUBJECTS	DOMESTIC SUBJECTS	MANUAL TRAINING	AGRICULTURE	BOTANY	MUSIC AND ART	DEBATING
Boys	6	—	7	3.10	.95	.91	.73
Girls	13	9	—	.51	.96	.69	.84

Comparing the intelligence ratings of the boys and girls preferring various high school studies, we find that the boys preferring science and mathematics rank above all other groups. Those selecting vocational subjects rank lowest. The girls ranking highest on the tests select Latin and foreign language. The girls selecting vocational and commercial subjects rank lowest on the tests. This holds true whether these groups are compared on the basis of central tendency or on the basis of the percentage belonging to the group who possess the highest and lowest grades of intelligence. (Compare Figures 46, 47, and 48, and Tables XXXII and XXXIII in Chapter IX.)

The brightest seniors in the entire state (all boys) select mathematics and science as their favorite study in high school. The brightest girls select foreign language.

There is also a marked difference between the mental strength of the boys and girls selecting the same subject. The boys selecting mathematics, chemistry, commercial subjects, and general science are far superior in mental capacity to the girls selecting these same subjects; while the girls selecting foreign language and Latin are far superior in intelligence to the boys choosing them. The boys and girls selecting history, English, and the various vocational subjects are about equal in mental strength.

The fact that the brightest seniors in the state are boys; that these brightest boys select mathematics and science as their favorite study in high school; that the largest percentage of boys select mathematics and science as their favorite study while the largest percentage of girls select English; that proportionately five times as many

girls as boys select foreign language—these facts all point in the direction of a genuine sex difference in the mental characteristics possessed by the boys and the girls and suggest that some radical readjustments are needed in the high school work.

**6. Differences between the boys and girls representing various occupations and economic classes.** (a) *Occupational groups.* Comparing the records made on the mental tests by the boys and girls belonging to the various occupational groups, we find that each occupational class has about the same proportion of boys and girls in the high school, with the exception of the skilled artisan, day laborer, and business executive classes. (See Table LXI.) The skilled artisan and day laborer groups have a larger percentage of girls than boys; the business executive class a larger percentage of boys.

TABLE LXI

PER CENT OF BOYS AND GIRLS COMING FROM DIFFERENT  
OCCUPATIONAL CLASSES

OCCUPATIONAL CLASSES	PROFES- SIONAL	CLERI- CAL WORK- ERS	SALES- MEN	SKILLED ARTI- SANS	BUSI- NESS EXECU- TIVES	DAY LABOR- ERS	FARM- ERS
Boys . . . . .	6	4	6	17	20	8	39
Girls . . . . .	6	4	6	19	18	10	37

The boys coming from *each* of these occupational groups make higher scores on the mental tests than do the girls. But the boys representing the professional, skilled artisan, business executive, and day laborer class rank far above the

girls belonging to the same occupational classes. The superiority of the boys representing the other occupational classes is about normal. It should be added that these differences remain constant whether the groups are compared on the basis of central tendency or on the basis of the percentage belonging to the group who possess the highest grades of intelligence. The percentage of boys and girls belonging to the various occupational classes who obtained the highest intelligence rating (A or B) on the tests is as follows :

OCCUPATIONAL GROUPS	PROFES- SIONAL	CLERI- CAL WORK- ERS	SALES- MEN	SKILLED ARTI- SANS	BUSI- NESS EXECU- TIVES	DAY LABOR- ERS	FARM- ERS
Boys . . . .	36	28	27	29	28	27	19
Girls . . . .	27	25	23	20	19	16	18

The same fact is brought out in Figure 51, Chapter X, which shows the score made by the middle 50 per cent of boys and girls belonging to each occupational group. Compare also Figures 52, 54, 55, 56, 58, and 59 in Chapter X. These show that the boys representing the skilled artisan and day laborer classes rank farther above the girls belonging to these groups than do the boys representing the other occupational groups.

(b) *Economic groups compared.* Comparing the number of boys and girls coming from the various economic classes, we find that a larger percentage of boys than girls come from homes of wealthy parentage and proportionately more girls come from homes where the annual in-



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come is low. The percentage of our total group of senior boys and girls who represent each economic class is as follows :

ECONOMIC GROUPS	ANNUAL INCOME OF PARENTS				
	\$4500 and upwards	\$3000-\$4500	\$2000-\$3000	\$1000-\$2000	\$500-\$1000
Per cent of boys . .	10	6	16	45	23
girls . .	7	4	17	46	26

The boys belonging to each of these economic groups rank higher on the intelligence tests than do the girls, as may be seen from a comparison of Figures 60 and 62 in Chapter XI. It will be noticed also that the boys representing the higher income groups rank decidedly higher on the intelligence tests than do the girls belonging to the same economic group, notwithstanding the fact that these wealthiest economic groups send a relatively larger percentage of boys to high school than any of the other groups. We might expect the boys from the lowest economic groups to make a better showing on the mental tests than the girls because this group has a larger percentage of girls than boys in our graduating classes. But the higher economic groups have proportionately more boys than girls who nevertheless make scores on the intelligence tests far superior to those made by the girls. Taken as a group the boys from these wealthiest classes rank above the girls in median score, in the record made by the middle 50 per cent, and in the percentage of individuals belonging to

the group who possess the highest grades of intelligence.

**7. Sex differences shown by our comparison of different communities and individual schools.** The community and sectional comparisons revealed no new facts. In each the boys maintain the superiority shown throughout the study. Comparisons between the sexes in different schools revealed the following conditions:

In some schools the boys surpass the girls by a wide margin. In other schools the girls all surpass the boys. In some cases these differences are very marked. In some schools the mental ability of the boys and girls is about equal. In other cases the range between the best and worst is very great. In many schools the distribution of mental ability for one or both sexes follows the normal distribution curve. In some schools the inequalities in mental strength of the members of the senior class are almost as great as those found among the members of our total or standard group. In other schools the range in mental ability is quite narrow.

When we consider that this is the rule even in the smaller schools the practical significance of these group differences for superintendents and teachers becomes evident.

**8. Discussion.** Four facts stand out most prominently in the above comparisons of the records made on the intelligence tests by our total group of senior boys and girls. (1) The marked and persistent superiority shown by the boys in all these comparisons. (2) The poor scholastic record made by this superior group of boys. (3) Certain sex differences in special mental ability suggested by the vo-

cational and scholastic preferences of the sexes. (4) The apparent mental inequality of the boys and girls representing various occupational and economic classes.

Since there were a third more girls than boys in the senior classes tested, we cannot conclude that the sex differences shown by this select group show typical sex differences in mental ability. The most probable explanation that can be offered for the marked superiority of the boys, taken as a group, is that many boys of the more inferior ability dropped out of school before reaching senior standing in high school, while more girls with inferior intelligence remained to complete their high school course. This is made all the more plausible because of the fact that the girls secure higher academic marks than the boys and show in other ways that they succeed better with their high school work. This might tend to drive the duller boys out of school while it would permit many girls with mediocre ability to remain until they completed the high school course.

But this explanation does not account for the fact that the brightest individuals in our total group are practically all boys. On the above theory the girls would have greater opportunity than the boys of being represented in the superior groups. It appears to indicate a fundamental difference in favor of the boys. It might be thought that our tests favored the boys, but since girls in the elementary grades make better scores on the same group of tests this objection would have no weight. The more rapid development of the girls under fourteen would hardly be sufficient to account for the results, if the tests actually favored the boys.

The fact that the boys rank higher on the mental tests than do the girls, while the girls are rated higher in their school work and so are more often accelerated and less often retarded, may be explained in a number of ways. (1) The school work may be better adapted to the special interests and abilities of the girls. By the curriculum given, by excessive memory work, and by routine procedure, the high school work may appeal more strongly to the interests and special abilities of the girls. (2) The girls may possess special mental characteristics necessary for school success—such as good memories, perseverance, conscientiousness, etc.—not so generally possessed by the boys. (3) The school may fail to reach and appeal to the real needs and interest of the boys as well as it does to the girls. Whatever the causes, they should be determined, especially the factors which make a seemingly superior group of boys fail where a mentally inferior group of girls succeed. The causes for this situation should be accurately determined and an adjustment made which would prevent in the future this great social and human waste.

That the brightest boys prefer mathematics and science while the brightest girls prefer Latin and English suggests a real and perhaps a fundamental sex difference in mental capacity, which can only be accurately determined by further psychological investigation. It is more than likely that there are certain mental characteristics or abilities in which men excel as a class, and others in which women are clearly superior. It should be determined by careful experimentation whether or not this is the case and in what respects the sexes differ. Future mental surveys



and all experimental work in psychology should take this problem into account.

The fourth result revealed by this comparative study of the intelligence scores of the sexes is socially and biologically significant. The fact that the boys from the day laborer and skilled artisan class make a better rating on the intelligence tests than the girls representing these same occupational groups suggests either that many of the boys coming from these occupational groups are not attending high school or that they have dropped out before reaching senior standing to go to work while their equally dull sisters remain in school. This hypothesis will, however, not explain the marked mental superiority of the *boys* coming from the professional and business executive groups, for here we have a higher percentage of boys representing these occupational groups. We also find that the boys representing the wealthier groups rank much higher on the mental tests than do the girls representing identical groups. We would naturally expect the fathers of these boys, the professional men, the business executives, and money makers to possess more than average mental ability, but whether this fact could affect the heredity of the boys more than that of the girls we must leave for the biologists to answer. The fact is that the boys belonging to these professional and wealthier groups make decidedly higher scores on our intelligence tests than do the girls coming from the same occupational and economic classes, even when these groups seem to have more than their normal quota of boys in the high school.

## PART III

### GENERAL CONCLUSION AND DISCUSSION OF RESULTS

#### CHAPTER XIV

##### SITUATION REVEALED BY THE MENTAL SURVEY

IN Parts I and II of this report we have given little more than a bare statement of the aims of the survey and the results which our study of the intelligence of high school seniors has revealed. In the present section we shall present the conclusions which may be drawn from the foregoing data and discuss our results in the light of other investigations and certain social and educational problems of far-reaching practical importance to the state.

**1. High school seniors a highly selected group.** The first important fact which stands out prominently in our results is that high school seniors, and to a marked degree all high school students, are a select group of young people. The high schools of the state are in a real sense class schools, planned and conducted for young people who possess more than average mental capacity or who possess native mental ability of a certain sort. All occupational and economic classes found in the state are represented in these schools

and in the senior classes of these schools in so far as they have children of the mental caliber and mental type which the high school conserves. But school statistics show that relatively few pupils who enter the public schools remain in school long enough to enter high school, that of those entering the high school about one-third drop out the first year, and that on the average only about 10 or 15 per cent of those who started in the first grade remain to complete a high school course.<sup>1</sup>

It has also been shown that most of this elimination before and after entrance to high school is due either to inferior mental ability or to a lack of the particular type of ability which the high schools foster.<sup>2</sup> Proctor showed that students with an I. Q. below 90 rarely enter high school and that those with an I. Q. below 100 usually drop out during the first year. We may conclude that the high school seniors we tested in this investigation were a highly selected group, mentally superior to even the average high school student. They are the best of a select group of superior individuals and represent the best mentally endowed young people in the state so far as the high schools are able to select and conserve them.

That they possess a rather special type of mental endowment is suggested by the fact that different school subjects (*e.g.* the academic and vocational) have been shown to require for success different grades and perhaps kinds of mental ability. And since our high schools have developed

<sup>1</sup> Strayer, D. D., *Age and Grade Census of Schools and Colleges*, Bulletin No. 451, U. S. Bureau of Education, p. 65.

<sup>2</sup> Compare L. M. Terman's review of "Literature and Studies, Intelligence of School Children," Houghton Mifflin Co., 1920, pp. 86-89.

only certain types of curricula, the talents and mental capacities of young people with special mechanical, musical, artistic, and other special capacities and interests have not, as a rule, been conserved and cultivated by the high school. Students with these types of special mental ability were rarely represented in the senior classes tested, as was shown in Chapters VII and VIII.

**2. Individual differences among high school seniors.** Notwithstanding this selective feature of the high school, which makes it possible for only the "fittest" to survive until graduation day by the constant elimination of those with the more inferior grades of mental ability, marked individual differences in intellectual capacity occur among the members of any single senior class, between the senior classes representing different schools, and the seniors coming from different communities and different sections of the state. In fact, the range of individual differences found among this selected group is almost as wide as that existing among any group of unselected individuals that has been tested. Five per cent of our total group made a score on the intelligence tests above 164 points out of a possible score of 190. Some individuals fell as low as 40. Half of our total group made scores ranging from 124 to 148 points; 5 per cent made scores ranging from 40 to 102. Two per cent of the total group made the superior grade of A+ intelligence for high school seniors.

**3. Distribution of seniors with the most superior grade of intelligence.** Individuals with this most superior grade of intelligence, *i.e.* those whose mental test scores placed them in the highest 1 or 2 percentile group, were found in



every section of the state; in every kind of high school from the smallest and weakest to the largest and best; in every type of community — rural, manufacturing, and urban; in every occupational class; and in alleconomic strata except the wealthiest; though not in equal proportions. They were not found in all individual high schools of the state nor in every senior class, but there is evidence that a proportionately greater number of individuals belonging to this most superior group come from the rural and agricultural sections of the state than from any other type of community.

**4. Special abilities of the brightest seniors not fully conserved.** A fourth fact which stands out prominently in our results is that the high schools are imperfectly adapted to the varied capacities, interests, and vocational needs of their students. They accelerate too few of their students. The brightest seniors in the state are not selected either by the high school or the elementary school for special advancement. Those accelerated possess, as a rule, only a high average grade of intelligence, while some members of the most superior groups of seniors were retarded by the school one or more times. A few individuals with inferior ability have been accelerated by the school, while practically all (91 per cent) of the seniors possessing the most superior grades of intelligence were only regularly promoted along with those who possess the most inferior grades of mental ability found among high school seniors. Summarizing all results on this point, we find that more than twice as many seniors were kept four full years on their high school course as possessed an *average* grade of

intelligence. About seven times as many possessed the *most superior* grades of intelligence as were actually permitted to shorten their high school course, while less than one-third of the group possessing the most inferior grades of intelligence were actually retarded by the high school.

We may conclude either that individuals with very superior mental ability cannot be easily and surely located by teachers and school officials or that they possess no adequate idea with regard to what might reasonably be expected *from* or done *for* such superior individuals. Our data show that many seniors in the 320 high schools tested have been working far below the level of their best standard of achievement, and hence are acquiring habits of inefficiency because their high school work is so poorly adapted to their intellectual capacities and needs. It seems to be a habit of high school officials to keep their students four full years on the course regardless of their ability to do the work, thereby encouraging the formation of habits of mental laziness, which will serve as a permanent handicap to the realization of the best potentialities of their most superior students.

That the high schools of the state are not succeeding in securing from their students results commensurate with their actual ability was further shown by our comparisons of each senior's intelligence score with his scholastic record. These comparisons showed that while the correlation between native mental ability and school success was in general rather high, many students who give unmistakable signs of possessing superior mental ability fail in their school work, while others with inferior ability are eminently

successful. Many boys with very superior mental ability make poor or mediocre records in high school, while girls with greatly inferior mental ability surpass them.

These facts, we believe, cannot be fully accounted for by assuming that the girls and the individual seniors who were more successful with their school work possess mental characteristics important for school success lacking in those who fail in their school work or possessed by them in a much less degree. They doubtless mean that the work of the high school is at present ill adapted to the interests and intellectual needs of many superior students (nearly all boys) who fail or make a poor scholastic record in high school.

It has also been shown in the preceding chapters that this maladjustment is worse in the high school than in the elementary grades, a most significant fact when we reflect that the most superior youths of the state are found in the high school, where they are not being dealt with on the basis of mental strength or intellectual interests. This comes about, in part, because the individuals with the most superior grades of intelligence cannot be easily and surely located ; in part, because teachers and school officials do not realize what should be expected from young people who differ so greatly in intellectual capacity or what should be done for individuals possessing such superior grades of mental ability to induce them to put forth their best efforts and so obtain results commensurate with their ability.

**5. Brightest seniors not going to college.** It is still more significant that so many of this most superior group of high school seniors will not attend college, while those

with the most inferior grades of intelligence are planning to attend, in ever increasing numbers.<sup>1</sup> Twenty-five per cent of the brightest seniors found in the entire state said they were not planning to attend college at all, while 65 to 70 per cent of the dullest seniors had definitely decided to go to college, most of them having already selected the college they expected to attend.

No systematic attempt has hitherto been made by the colleges of this or any other state to locate definitely the high school seniors who possess the most superior grades of intelligence or to make suitable provisions for conserving their special mental abilities by the right kind of education or training. Some colleges and universities use the results of intelligence tests as requirements for admission. But such attempts at selection conserve only the best of those who apply for admission. They do not reach the superior individuals who do not go to college, many of whom, doubtless, have been eliminated from our schools even before completing a high school course. It is the fact that the best young people have not been selected and encouraged to attend our colleges and universities, while large numbers of those with inferior grades of mental ability have been flocking to our colleges in ever increasing numbers, which accounts for a situation prevalent in many colleges and universities to-day — a situation where we have literally thousands of students interested in little else than having a good time for three or four years, “mak-

<sup>1</sup> Since the number of individuals in any state who possess superior and very superior ability is limited, the marked increase in attendance in our colleges must come from those who possess the more inferior grades of intelligence.



ing a fraternity," or converting the college, so far as lies within their power, into a mere fashionable club for the unambitious well-to-do youths of our land.

Most colleges and universities have taken definite steps to meet this situation by raising their standards of scholarship. In this manner large numbers of students who are intellectually unable to do the work or who are not interested in the work are eliminated each year. But few institutions make any pretense of adjusting their work to the special abilities of their brightest students, except by occasionally permitting ambitious students to do more than the average amount of work, and so to complete their college course in less than normal time. The latter plan is pretty generally in vogue, but at no college, to the writer's knowledge, is it so administered that the committee who grants the permission to take extra studies can actually ascertain what might reasonably be expected from the student who is asking for this privilege. The only criterion of judgment used is the student's past scholastic record. His real intellectual capacity, if considered at all, is estimated on an insufficient basis. So far as the writer is aware, no means are at present available in any university whereby those students who could do three or four times the amount of work done by the average student are required to take extra work or in other ways helped to make the most of their superior ability. No machinery is at present available for convincing professors and instructors of the fact that such students, if given the opportunity, could and would do such a superior grade of work. Neither do we have any administrative machinery within

the college for locating such superior students in their freshman year or ascertaining with scientific exactness what might reasonably be expected from individuals with their type of ability. No method has yet been devised to determine what ought to be done for such superior individuals, for the simple reason that up to the present time we have had no reliable way of locating them.

It should be added that most colleges and universities, through their deans, administrative officers, and individual instructors, are striving to solve this problem, which, because of its complexity and delicacy, presents difficulties almost insurmountable. For its solution the technique and method of the mental survey, recommended below, comes as an invaluable instrument. For as the method of the survey is improved, we shall be enabled not merely to locate and conserve the talents and capacities of the best young people in the state, but to evaluate the work of all college students in the light of their native mental endowment, and so to get a more accurate measure of what may reasonably be expected from students, who vary so greatly in native mental ability.

**6. Ablest students not located by the high school.** It is also true that few provisions are made at present by our *high schools* to locate the students who are equipped best mentally; or to minister to them in accordance with their special capacities and individual needs. There is, on the other hand, considerable evidence in our data that the special abilities of the most superior students are often smothered by the leveling-down process which is so popular in our schools, and by the fact that the work of the school

is not adapted to their mental capacity nor results demanded commensurate with their ability.

**7. Vocational needs of individuals and state not adequately met.** Another situation revealed by the survey is the fact that high school students are not being properly equipped by the school for their vocation in life. We have just pointed out that neither in the high school nor in the college is the work well adapted to the mental ability of the students; that their education and training is not being carried on in strict accordance with the mental capacity of the individual students; that the brightest students are not being adequately taken care of. The plan has been to measure educational progress by the time required to complete a set traditional course, originally designed for a very *special* group of individuals, not an unselected group, composed of individuals possessing all grades and kinds of mental and physical ability, such as we meet when we organize a school in a democracy. Our results clearly show that the work of our schools is not so organized or administered as to fit individuals, who vary so greatly in their native mental and physical endowment, most economically and efficiently for their duties in life.

What is just as significant as this failure in the conservation of capacities and talents is the fact that the vocational needs of the state are not being met in a satisfactory way. Only sixteen lines of work were selected as life occupations by our total group of 6188 high school seniors. The high schools seem, therefore, to be directing their students towards a limited number of lines of work, and are not meeting the vocational needs of a modern demo-

cratic state, where all types and grades of talents and ability should be conserved by education and training.

The plan has been and still is to give certain courses of prescribed work in the high school. If this work cannot be done by the student or does not meet his intellectual and vocational needs, the student must try to adapt himself to what is given. Little attempt is made to educate him in accordance with his abilities or actual life needs. The principle promulgated in the parable of the talents by the Great Teacher is being ignored or at least not practically applied in our educational work to-day. We have people in the state who are mere "hewers of wood and drawers of water" who should have been directed towards and trained for higher types of work.

We must conclude that wiser educational and vocational guidance is needed in all our educational work if we would conserve and cultivate the capacities and abilities of our young people in all their variety and richness. Less than two-thirds of the seniors taking our mental tests had chosen their vocation in life. And the boys and girls coming into the high school from all occupational classes and from different economic groups are being unconsciously directed towards *a few lines of work*. Evidence is also at hand which shows that little attention is given to the matter of selecting a life career even by high school seniors or college freshmen. Many of these young people are more or less adrift so far as their life work is concerned. Others are selecting occupations and actually planning to prepare for lines of work ill adapted to their mental strength. The brightest girls in the entire



state are planning to take up stenography and shorthand. The dullest girls in our total senior group are planning to enter the teaching profession. The boys selecting medicine and preparing to take a medical course rated on the intelligence tests on a par with the group who chose a mechanical trade, and the girls selecting nursing ranked next to the lowest occupational group. Moreover, the range in intelligence for the seniors choosing the same occupation was in general very wide. The dullest and brightest individuals quite often chose the same occupation. In some of these occupations, teaching and business for example, there is opportunity for the exercise of the full mental capacities of the brightest seniors. The only social waste and tragedy in such cases would be the failure of those too weak mentally to compete. But other occupations chosen by the brightest seniors require only an average or an inferior grade of high school intelligence for success. Such occupations are often chosen by the brightest seniors, while inferior seniors in preponderating numbers select such occupations as teaching, medicine, and nursing, all of which demand the highest type of intellectual capacity.

From these and other facts revealed in this study we must conclude that the students in our high schools need more efficient vocational guidance than the schools are at present able to give them. In no other way shall we be able to conserve and cultivate to the fullest extent the capacities and talents of all young people in the state.

**8. Individual differences in vocational and scholastic interests.** Marked differences are also found between the

vocational and scholastic interests of the students now attending our high schools. This was shown not merely by the preferences which these students showed for different high school studies, the various life occupations they selected, and the type of high school course pursued, but by the general level of intelligence of the individuals belonging to our total senior group. There are marked individual differences not only in amount of intellectual capacity but also in kind. But the varieties of interest and ability indicated by our results fall far short of the varieties found in actual life. We must, therefore, conclude that the high school as now organized and conducted is more or less of a selective agency, eliminating many young people from its courses who do not possess the *type* of interest or *kind* and *degree* of mental ability fostered by its present curriculum.

**9. American high school not truly democratic.** From our own data and the results obtained by other investigators we conclude that the American high school is not democratic in the best sense. All occupational groups and all economic classes had representatives in the high schools tested and in the senior classes of these schools, as we have shown in Chapters X and XI. But such students as do attend and remain to graduate have the type of mental ability and the degree of native mental endowment required to do the work that is prescribed in the course.

A marked difference was found in the intellectual level of the seniors pursuing different types of high school courses — the academic, the classical, and the commercial and vocational courses. It was also found that the brightest students

prefer certain types of studies, such as science, mathematics, and foreign language. The seniors with the most inferior grades of native mental ability prefer the so-called vocational courses. A number of years ago the duller students, or those with a "non-academic" mind, who could not succeed in Latin or mathematics, were dumped into the commercial course. But as has been pointed out by Terman and others<sup>1</sup> the teachers of these subjects soon sensed the situation and began raising their standards in order to eliminate these inferior students from their courses. Now we find the students who are taking the commercial courses in high school occupying second place and the dumbest seniors pursuing a vocational course. (Compare Chapter VIII above.) But in Indiana a reaction against admitting the duller students to these vocational courses has already set in, for the teachers of these subjects and the vocational directors of the state are advocating daily that only the brightest students should be admitted to the vocational course, saying that "it takes a bright boy to be a mechanic," etc. The fact is that young people below a certain level of general intelligence and those possessing specific mechanical, musical, and artistic abilities are not being properly taken care of by our elementary and high schools for reasons that are apparent to all.

The problem is how to conserve and cultivate the capacities and talents of *all grades and kinds* of individuals. This is not now being done and probably cannot be accomplished until those in charge of our educational work

<sup>1</sup> Terman, G. M., "The Intelligence of School Children," Houghton Mifflin & Co., 1919, p. 90.

change their point of view. To be truly democratic and to meet the needs of a democracy our public schools, from the kindergarten to the university, must be so organized and conducted that the abilities and capacities of all grades and types of children will be fully conserved and cultivated.<sup>1</sup>

**10. High school better adapted to the interests and needs of the girls.** Another important situation revealed by the survey is that the high school work seems better adapted to the interests, capacities, and intellectual needs of the girls than the boys. This is suggested by the fact that the girls are more rapidly advanced by the school and are rated consistently higher on their scholastic work than the boys, notwithstanding the fact that the boys who remain to graduate and with whom these girls are competing give unmistakable signs of possessing superior intellectual ability.

For some reason or reasons not made clear by the survey the high school girls succeed better with their school work than the boys. Girls with inferior grades of ability succeed where boys with far superior ability fail, or make a scholastic rating much below that given to the girls pursuing the same courses.

On the basis of our present results we cannot say anything definite with regard to the intellectual superiority of one or the other sex. What is established by our data is the fact that senior high school boys ranked decidedly and consistently higher on the intelligence tests than did the girls; that the higher up in the scale of intelligence we go the greater is the proportion of boys; that notwithstand-

<sup>1</sup> For a further discussion of this point see section 4 of Chapter XV below.



ing the mental superiority of this select group of boys, the girls belonging to the same classes are rated higher on their high school work and are advanced more rapidly and consistently by the school than the boys ; lastly, that a marked difference exists between the scholastic and vocational interests of the boys and girls which strongly suggests a fundamental sex difference in the mental capacity of the sexes and may help to explain why the high schools of the state as now organized and conducted seem better adapted to the interests and intellectual need of the girls.

**11. Class, school, and community differences important.** We should also point out that differences in the intellectual capacity of groups of individuals — senior classes, the same grades in different schools, differences between individual schools, between schools or grades in different types of communities, and between the individuals coming from different sections of a state — may be as great and just as significant for the proper solution of certain educational and social problems as the differences between individuals, though we need different methods for their determination and measurement. From the data at hand it is obvious that these group differences are not clearly recognized by school officials. Most people do not know that they exist. The scholastic accomplishment of a class, grade, or school, and of a school system located in any part of the state is still being judged by standards of achievement obtained from without the system, community, or section, and with little or no regard for the actual mental capacity of the classes, grades, schools, or school systems, whose educational accomplishment

is being evaluated. In this manner the results obtained by a teacher in a school where 51 per cent of the pupils are found to be feeble-minded,<sup>1</sup> are judged by the same standards of accomplishment as the work of a teacher in a school where 90 per cent of the pupils make an A or B intelligence rating, for their age or grade.

At present the achievements of individual high schools in all parts of the state are evaluated by the state high school inspector regardless of these group and community differences in the raw human material with which the school must work. Moreover, colleges and universities assume that the native mental endowment of the seniors coming from all commissioned high schools and from every community and section of the state is the same or at least standard if only they have completed a prescribed four-year course of study. Our mental survey has shown that this is not the case. It has shown not merely that these group differences exist, but why they must be taken into account in the solution of many of our most important social and educational problems.

**12. Intelligence no guarantee of school success.** Lastly, from our own data and from the facts revealed by other investigations made in our laboratory we must conclude that intelligence tests are not adequate for prognosticating an individual's school success. Mere ability to learn will not insure its accomplishment. Ability to perform is not synonymous with actual performance. Mere

<sup>1</sup> Book, W. F., "Variations in Mental Ability of the School Population of an Indiana County," *Proceedings of the Fifth Annual Conference on Educational Measurements*, Vol. IV, April, 1919, Indiana University Book Store.

intellectual capacity, or the ability to do school work, will not insure successful work, though it is a necessary precondition, and one of the most important factors in bringing it about. Our results clearly show that a senior's *success in school* is conditioned by other factors besides his intellectual capacity. Many seniors endowed with the highest grade of intelligence are failing in school or making only mediocre success, while others with average or seemingly inferior grades of intelligence are being regularly promoted. We conclude that other mental characteristics, such as persistence, effort, and mental attitude towards the teacher and school, play an important rôle in achieving success in school. These facts point not only to the need of having reliable tests for measuring such mental characteristics as we have just enumerated, but show that teachers should appeal to them and, so far as possible, cultivate and improve them, since they are necessary not merely for success in school, but probably also for attaining the highest success in life.

## CHAPTER XV

### READJUSTMENTS AND REFORMS SUGGESTED BY THE SURVEY; THE CONSERVATION OF HUMAN CAPACITIES AND TALENTS

THE goal of all science and the aim of most scientists is to discover the facts needed to guide human aspirations and conduct. No human endeavor is worthy the name of science unless it results in the finding or verification of such facts. We would therefore fall short of our duty if we failed to indicate some of the ways in which the facts revealed by this survey might be used as a basis for further experimentation and as a guide for the solution of some of the present-day social and educational problems to which they pertain. We might legitimately be accused of scientific laziness if we failed to point out some of the readjustments which should be made to remedy the situation in the colleges and schools revealed by the survey, or if we failed to make such suggestions for the improvement of these conditions as to us seem warranted by the facts. We shall, therefore, in this and the following chapters attempt to point out the practical significance of some of the facts which the survey has revealed and make such suggestions for needed educational readjustments as in our judgment are warranted by the facts.



1. **Change needed in our point of view.** The facts obtained in this survey point, first of all, and most conclusively, perhaps, to the need for a change in our point of view with regard to what formal education in a democracy *can* and *should be expected* to accomplish. Our schools were originally planned to meet the intellectual and practical needs of a few individuals; namely, teachers, ministers, and lawyers. Their work has since been gradually extended in scope until they now attempt to serve all classes of people in the state, with all the variety of interests, degrees of intellectual capacity, and diversity of vocational needs which the life of our entire population presents. The wide individual differences in capacities and interests and in the intellectual and vocational requirements which such an unselected mass of people presents, need to be more fully and keenly recognized by all who are engaged in educational work. The wide divergence in intellectual capacity, in the intellectual and vocational needs of this heterogeneous group should not merely be recognized, but its educational significance should be more clearly understood. We should understand better just what should be expected *from* and what ought to be done *for* young people who differ so tremendously in mental capacity, in intellectual interest, and in their life or vocational needs.

We also need to recognize what successful education in a democracy really means. If all are to be educated, the variety of abilities, intellectual interests, and the individual needs of all must not only be recognized, but met in the best way possible. We must know the best that education can do *for* or *with* such a heterogeneous group. We need

to remember that in any large unselected group of individuals or in the average school grade or group there are about as many individuals with very superior intellectual endowment as there are pupils who are mentally deficient in a marked degree; that their superiority is really present when these children enter school; and that it persists as a constant factor in their life. We must remember also that it is a natural or normal situation for some individuals to be superior in intellectual capacity while others are deficient; that this superiority is usually general rather than freakish or one-sided, although some individuals probably do possess special mental abilities to a marked degree; and that there are definite limits for the mental accomplishments of those whose mental endowment is below the average for any unselected group. We should also remember that such mentally deficient or intellectually superior individuals may be located by means of reliable intelligence tests in any class or school; that the school accomplishment of each individual should be measured in the light of his native mental endowment; and that the work of a teacher or the educational accomplishment of a class or school cannot be justly evaluated or correctly measured unless the mental capacity of the "pupil material" is taken into account. It is also important to remember that the individuals with superior ability are more difficult to recognize and locate without mental tests than the mentally deficient; that the talents of this most superior group of individuals should be specially conserved and assiduously cultivated because they become the leaders of society in every line of work; and finally that in a

democracy the talents of *all* individuals, the mediocre and weak along with the best, should be zealously conserved and cultivated in accordance with the principle set forth in the parable of the talents by the Great Teacher. This ideal conception of efficient education in a democracy needs to be more fully and keenly recognized, because the intellectual abilities of the people of any generation or state constitute its most precious asset.

On account of traditional tendencies in education and the ideas we have held in the past about the meaning and purposes of human life, our schools have been made more of a general leveling agency than is suited to a democratic society. The tendency has been to try to bring all up to certain standards of attainment and to demand from all certain traditional types of intellectual achievement rather than to try to conserve and cultivate by means of education all types of worthy capacities and interests.

In the light of the marked individual and group differences revealed by this study it will be seen why this cannot be done. We need, therefore, not merely to understand the diversity of the differences found among the young men and women in our colleges and schools, but also to recognize that in a democracy this diversity of talent should be fully cultivated and conserved. In a democracy, where all should be educated and helped, the correct and efficient thing to do is to educate and train all in ways which will develop to the fullest extent the peculiar abilities of each individual so far as these conform to the standards and ideals held by organized society to-day. In a word, *we need to break away from set courses and superimposed*

*standards, and regard education more as a process of conserving and cultivating human capacities and talents in all their variety and richness.*

**2. Talents of the best should be especially cultivated and conserved.** We should, first of all, make every possible attempt to conserve and cultivate the mental capacities and talents of the most gifted young people in the state. Definite, workable schemes for the location of such individuals should be devised and used continuously from the kindergarten to the university, because such differences manifest themselves very early and remain more or less constant as mental development proceeds.

The primary purpose of this investigation was to locate by means of group intelligence tests the best intellectually endowed young men and women graduating from the high schools of one state and to make arrangements whereby this group of superior young people might be encouraged and helped to continue their education in a college or university. This we believe is one of the most important problems confronting the colleges and high schools of the state. Our data show that about 25 per cent of this group of superior young people are not even planning to continue their education beyond the high school stage, while 65 to 70 per cent of the high school seniors who possess only average or inferior grades of intelligence are planning to go to college. Some workable plan should therefore be devised whereby the young people who possess the most superior grades of native mental endowment might be definitely located and encouraged to obtain a college education.



But what is equally important is to adapt the work of the high school and college to the intellectual needs of these superior individuals. This will require a new and radically different treatment, for such individuals do not need the same kind or amount of help that should be given to a student with only average ability. Many brilliant young people now in college are frittering away their time by taking only the normal amount of work. College authorities and teachers should therefore work out the best things to do *for* such a superior group of individuals to induce them to put forth their best efforts and so to make the most of their opportunities and ability. They should really be located as soon as they enter the high school so that the work there could be adjusted to their mental strength and intellectual interests and needs, as is not now done in any systematic way.

There is unmistakable evidence in our data that this group of superior individuals often have their intellectual interests dulled in high school because they are not given the kind and amount of work required to occupy their minds fully or to satisfy their mental curiosity. The work they are required to take is often not adapted to their intellectual interests or needs. Instead of stimulating the development of their superior abilities they are treated in ways which favor the development of habits of intellectual laziness because they are encouraged to work far below the level of their best attainment. This not only means a handicap and loss to the individual, but a waste to society and the world.

Public school authorities and teachers need also to rec-

ognize that the individuals who possess these most superior grades of intellectual capacity may be located when they enter school<sup>1</sup> and the work conducted in a way that would be most helpful to them. Primary and all grade teachers in the public school need to understand better than they do just what may reasonably be expected *from* and what should be done *for the children in their classes who possess the most superior* grades of intelligence.

**3. All types and grades of mental ability important.** Some rather narrow views have been held with regard to the true meaning of democracy and in regard to what sort of education was needed in a democratic state. A democracy does not mean that all are alike or that they should be made alike by education and training, even if this could be done. Democracy means opportunity. It means that each individual should be given an opportunity to make the most out of his life and native capacities that is possible for him, the same as every other individual in the state. Socially it means that all grades and types of capacity and talents be conserved to society and the world.

<sup>1</sup> The best, and probably the most widely used, group scale of intelligence for use in the first three grades is the Primer Scale, devised by Mrs. S. L. Pressey, Research Fellow in Psychology, Indiana University. The scale is easy to give, easy to score, and carefully standardized in procedure and objective in scoring. Also (no small merit) the materials are comparatively inexpensive. This scale may be had in any quantity by addressing the Department of Psychology, Indiana University, Bloomington, Indiana. The Dearborn scale is also used extensively, but the timing and scoring on this test are very inexact, and the materials expensive. Among other examinations for the elementary grades may be mentioned the Otis and Haggerty scales (World Book Company, Yonkers, N. Y.) and the Kingsbury scale (Public School Publishing Company, Bloomington, Illinois).

The most efficient and economic scheme of education in a democracy is one, therefore, which insures the full development of all individual capacities and talents in all their variety and richness to the end that the best interests of both the individual and state may be most fully served.

One of the most needed readjustments suggested by our data is a better adaptation of the school to the capacities and needs of those who possess the most inferior grades of mental ability found among the heterogeneous group of individuals who now attend the public schools. Our schools have been developed to take care of our future leaders and those who are most fortunately endowed. But with the growth of the democratic ideal and the passage of compulsory education laws we have been forced to take special care of those who are mentally deficient, because this problem was forced upon our attention by their utter inability to do the regular school work. But we need to realize better than we do what actually can and ought to be done for this deficient class. The tendency in the schools for the feeble-minded, in schools for the handicapped blind, in the special classes arranged by the public school to care for this mentally defective group, has been to give them the same course of study used with normal children, or, to be more exact, a course which was originally planned for a group of students who expected to take up the more intellectual pursuits of present day society. Can the meager talents of this unfortunate group, we should ask, best be cultivated by a course of study which has been developed for this professional class? Will the present school course

fit them best for the work in life which they really can or ought to be trained to do, or must they be taken care of in a different way?

But standing between this most inferior group and the superior individuals referred to in the previous section of this chapter are many individuals who vary greatly in intellectual capacity. Still the practice of the school has been to try to meet the intellectual as well as the vocational needs of all these individuals in the same way, by means of the same course of study and the same methods of instruction, all of which have been developed for those who are by nature more fortunately endowed. The result is that large numbers of individuals possessing the more inferior grades of mental ability fail in their school work year after year and are finally forced out of school at the age of fourteen with an education totally inadequate to meet their vocational needs. Perhaps the most prominent thing they have obtained from their school experience is the habit of failing at most things which they were asked to do, because the work was ill adapted to their mental strength and personal needs. That the meager talents of these young people cannot be developed and made most serviceable to themselves and to the world by such educational procedure is demonstrated by the fact that they are forced out of school as soon as the law permits them to leave, having completed only the work of the first three or four grades. Some continue until they complete the work of the eighth grade and are then eliminated, chiefly because they lack the mental ability to do the amount or kind of intellectual work emphasized by the present school course. Many try



high school and are weeded out there the first or second year for the same reason.

One of the important questions raised by our data is whether our present educational procedure which conserves the individuals who possess superior intelligence or mental ability of a certain kind also succeeds equally well in developing other grades and types of mental ability or whether some rather radical readjustments should not be made to adapt the work of the public schools better to the varying capacities and needs of all types of children who attend them.

**4. American schools and colleges should be made more democratic.** It should be clear from what has already been said that our schools cannot be considered wholly democratic or thought of as serving the best needs of a modern democracy unless they take proper care of all types of people and educate them in accordance with their intellectual capacity and actual needs. As has already been pointed out the high school serves only a small proportion of the total population, largely because those with the more inferior grades of mental ability have been forced out of school. Reform after reform has been attempted to make our high schools more widely serviceable to the young people of the state. At first they were mainly preparatory schools for the college. But it was soon found that so many young people who attended the high school would not attend college that arrangements had to be made to try to serve these also. In attempting to make the work more serviceable to this larger group, various subjects have been added to the traditional curriculum.

Many so-called practical subjects, which make a wider appeal and which presumably do not require the same kind or amount of mental ability demanded by such subjects as mathematics and Latin, have been added to the traditional list of studies offered. But the teachers of these more practical subjects soon began to raise their standards and so forced out of their classes and out of the high school those with grades of mental ability slightly inferior to the better high school students. The same tendency is now manifesting itself with regard to the vocational courses which have more recently been added as a special feature or type of work, designed to take care of the needs of those whose best interests could not be served by the traditional academic courses. How, we should ask, can the high school and its work be made more truly democratic? And how can our colleges and universities arrange to take better care of *all* the young people who want to attend, while at the same time preserving and fostering that select group of young people who possess the most superior grades of mental ability found among the young people of the entire state?

The problems presented by this situation are not simple or easy to solve and any perfect adjustment is doubtless a long way off. But the issues involved should be squarely met and the problem solved as rapidly as possible. The most pressing need which our data suggest is for making better arrangements to take special care of that group of very superior young people which we tried to locate by means of this survey.

Individuals with the most superior grades of mental

ability should be located in both the high school and the college, and arrangements made whereby their special talents might be fully and most economically cultivated. It would also seem possible to make a further differentiation of the high school and college courses, and to make certain readjustments in the standards of admission to these institutions and to specific courses, which, among other things, would set definite intellectual as well as academic standards of requirements for the different lines of educational work offered. If this or some similar line of development is not followed the ever increasing demands for a high school and college education and the growing enrollments will soon force a lowering of the standards now held for the traditional courses, and will make it increasingly difficult for these institutions to take proper care of that small group of *superior students* whom they were originally created to serve.

**5. Better provisions needed for vocational training.** Such an extension of the courses of study for the high schools and colleges would mean, first of all, better provisions for vocational education. This doubtless means that a reorganization of our entire system of schools must be made, or rather that their present duties and work be much extended. Some things can and will continue to be done, for the special groups now inadequately served, by means of the traditional courses and the foundational work required for all effective vocational training. But it should be clear that our present educational system is much too narrow to meet the needs of *all* the people and that in one sense our schools are really class schools appeal-

ing only to those who are most intellectually fit. It is the fact that there are so many individuals who do not have the mental ability to complete the work even of the elementary grades, but who could be trained to do many useful lines of work, that calls special attention to the need for vocational education of an elementary grade.

We have at one end of a complete scheme for vocational education the task of preparing the best individuals in the state for such professions as engineering, medicine, law, statesmanship, and the like. This is now being successfully done. We have at the other extreme the task of educating those who are mentally deficient in a way that will make them of as much service to themselves and to the world as is possible. But we must also train in an effective manner all those who fall in between these extremes. It is this fact which makes the problem of vocational education not merely tremendously important and pressing, but immeasurably difficult, — a task which, if the thesis of this discussion is valid, marks the very culmination or flower of the entire educational process in a democracy.

One of the most important readjustments, therefore, which the data of this survey suggest as urgently needed, is some such extension of vocational training as is here suggested, for in no other way can *all the abilities and capacities of all the people be fully conserved and made to function in the individual and social life of the state.*

**6. Need for better educational and vocational guidance.** If the talents and capacities of all our people are to be thus fully conserved and cultivated, there is need for a special type of educational and vocational guidance,



which our high schools and colleges are at present unable to give. Young people must not only be educated and trained in accordance with their ability, so that they may render to themselves and to the world their best service; they should, so far as possible, be directed *towards* and educated *for* the work in life that is best suited to their mental strength, and in harmony with their intellectual interest.

This need for wiser educational and vocational guidance was impressed upon the writer in many scores of ways as he worked with the data revealed by this survey. The problem as a whole will, perhaps, never be satisfactorily solved. Yet the great social waste and individual discouragements, which result from having men and women with mediocre ability engaged in tasks clearly beyond their intellectual capacity and competing with those who by their every act brand them a failure, should, as far as possible, be removed. It is only surpassed by the greater tragedy or failure of society and the school, which permits young people to choose and prepare for vocations in life infinitely below their level of mental ability and which therefore do not require the complete and healthy exercise of their minds. This situation, if permitted to exist and to take care of itself, will create a regular factory for the manufacture of an army of malcontents and Bolsheviks who will seriously menace the future welfare of society.

Teachers and school officials should, however, not be misled by the wild claims so often made by enthusiasts in the field of vocational education or by the statements and writings of amateur students of human nature who

paint glowing pictures of what may be accomplished by means of vocational guidance. Only a few things can and very many more things cannot be done in this field with our present knowledge.

Perhaps we should talk more about educational and less about vocational guidance than we do. The best and practically the only contribution which can, at present, be made to the solution of the problem of vocational guidance comes from the science of mental measurements. By means of mental tests, reliable intelligence norms may be established for successful workers in the various professional, semi-professional, skilled trade, business, and labor pursuits. As a result we will doubtless soon know what grade of mental capacity is required for success in these various occupational fields. But many mental surveys must be made before such norms can be satisfactorily established because it will be necessary in connection with the establishment of such norms to show the extremes of ability for each standard occupation below which failure is almost certain and above which an individual would be wasting his best efforts, because intellectual ability above that point was not required for success in that field of work.

Results already obtained indicate clearly that for some vocations there is such a middle range of mental ability within which range one's chances for success, if such a grade of ability be possessed, would be practically assured. Whereas an individual with less native mental ability would be almost certain to be a failure in that type of work. But even when such norms or standards have

been established, the best we can do by means of intelligence tests is to determine in which occupational field or group of vocations a given individual is most likely to succeed. No data are available and no methods have yet been devised which would enable a teacher, parent, or superintendent to determine with any degree of accuracy which one of a hundred occupations a given individual is best fitted to take up. A child with average native mental ability or with super-intelligence may in all probability succeed equally well in a dozen vocations, if he happens to be interested in them all, or possesses certain other mental characteristics which are essential to success in those fields. The best we can do at present is to make sure that our young people select occupations that are adapted to their particular grade and type of intelligence, and after this let natural interest and various practical and economic considerations determine which of the group of vocations demanding that grade of intelligence the individual should choose.

But with educational guidance the case is different. If we assume that all young people should be prepared for the work in life that would enable them to make the greatest contribution to the world, we must conclude that vocational and educational guidance should go together. In fact educational direction must precede vocational guidance, for we assume that each child is to be educated for a certain line of work. Hence, one of the tasks of the teacher and the school becomes that of trying to find the best possible way of achieving just that result. Here the opportunity of the teacher and educator becomes very great.

They become the specific agent of the state, having in charge the sacred task of conserving all grades and types of ability and talent found in the school. For only by such wise educational direction and by sharply directed instruction can each individual be educated in accordance with his native capacities and interests.

Readjustments must, therefore, be made which will get us away from the traditional procedure that has made our schools so much of a leveling agency, a procedure which forces those with the more inferior grades of mental ability to take school work that was originally designed for academically minded and intellectually superior individuals. If an individual cannot do this work, he is forced out of the system, or hopelessly stranded somewhere along the line. If mental tests were resorted to and the native mental ability of all pupils approximately determined, special educational and vocational work might be arranged for all who are not now being adequately cared for by the school, more especially for the group who, no matter how long they attend or how hard they try to do the work prescribed by the traditional course, are doomed to failure because they do not possess the grade or kind of mental ability required to do that sort of intellectual work. If such a readjustment were made, we would have fewer educational tragedies than are now enacted in our public schools, because young people are required to do a type of work at which they can never succeed.

In all this we have said nothing about the waste which results from the fact that those with special mechanical, musical, or artistic ability are required to pursue a tradi-



tional academic course of study in the high school. But we hope it has been made clear that the giving of mental tests as a basis for wiser vocational and educational guidance is one of the means of reducing such waste and one of the needed readjustments which should be made in our educational work.

**7. Group and community differences should be recognized.** So much for the readjustments needed to make proper adaptations to the marked *individual* differences which are found in our society and schools. But another situation has been revealed by the data collected in this survey and by other investigations recently made by means of intelligence tests. These make necessary a number of readjustments in our educational procedure, on both its instructional and administrative sides. The fact that marked differences exist between the intellectual capacity of senior classes, between the native mental endowment of pupils belonging to the same grade but in different schools, between all the pupils in one school or building and the pupils attending another building or school in the same city, and finally between the pupils in the schools of one city or community and those of another—these *group* differences make it impossible to get the same grade or amount of work from these several groups of pupils.

In measuring the educational accomplishment of any class, grade, or school, or in evaluating the work of any teacher, school, or school system, the fact of these group and community differences in the intellectual capacity of the raw human material with which teachers must work

should be taken into account. They should also be considered when a decision is made in regard to what ought to be done for young people in such classes, grades, or schools.

In the light of the facts regarding these group differences, standards of school accomplishment and intellectual achievement for both individuals and classes or groups become only relative things and their school achievement must be evaluated in the light of what may reasonably be expected from an individual, class, or school possessing their particular type and grade of ability.

**8. New method needed for evaluating school accomplishment.** In deciding what can or ought to be done for a particular individual or group we need, therefore, a new method for evaluating their work. We need a method for measuring school achievement which will take into account the native mental ability of the individual, or group, as well as a standard which is applicable to a theoretically average individual or which is demanded by the world. We need a method and standards for measuring progress in learning, rather than for measuring school achievement, standards which will enable us to measure progress in the type or kinds of learning which are actually going on. Teachers in dealing with individuals or classes, and superintendents in evaluating the work of a particular teacher or school as well as the work of their entire system, need to take into account the native mental endowment of the pupil material with which they and their teachers must work and evaluate school achievement in the light of the native mental ability of their pupils.

A new reliable and practical method for measuring school accomplishment is therefore needed, one which will give us a new standard for measuring progress in school. Only when such a standard or "ability index" has been obtained, one which shows the ratio between intelligence and actual progress in learning or school accomplishment, one which is thoroughly practical and reliable, can the work of a pupil, the success of a teacher, or the accomplishment of a class or school be justly evaluated.

It should of course be remembered that it is still valuable to measure the achievement of an individual, a class, or a school, by a standard which the world has fixed, or standards which have been obtained from a large group of unselected individuals. The reasons for this are apparent. Such a standard is helpful for purposes of educational and vocational guidance as it indicates the type of success which must be achieved by an individual if he desires to be successful in a given line of work or is to make normal or unusual progress. But if we wish to evaluate the actual progress that can or should be made by a pupil, a class, or a school, the native mental endowment of such an individual or group must in all justice be taken into account. In no other way can we determine what legitimately *ought* to be expected or demanded from a given individual or group. This is the true pedagogical standard, showing what *can* and *ought* to be achieved by a given individual or group, and should be used by every teacher or superintendent who desires to conserve and cultivate the talents of all his pupils in an economical and efficient way.

## CHAPTER XVI

### VALUE AND USES OF INTELLIGENT TESTS AND THE MENTAL SURVEY

THUS far in this discussion we have merely tried to restate the more important facts and to point out some of the readjustments which should be made in our educational theories and practices better to adapt the work of our colleges and schools to the mental abilities, interests, and vocational needs of the individuals who are being educated. We shall now point out as clearly and specifically as we can some of the ways in which intelligence tests and mental surveys may be helpful in making these adaptations, or used in helping us to solve some of the more important practical problems which modern educators and social workers meet.

Reliable intelligence tests and systematic mental surveys may be used in many ways, of which the following are, perhaps, the most important :

(1) To make individual diagnoses for purposes of grade classification and educational guidance : (*a*) locating the most brilliant, dull, and average individuals belonging to any class, grade, school, or group ; (*b*) prognosticating their probable success in school and life ; (*c*) determining what might reasonably be expected from them in the way



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of school achievement; and (*d*) making an educational diagnosis to determine what ought to be done for individuals who possess such different grades of intelligence.

(2) To make group comparisons for the purpose of determining and studying class, grade, school, and community differences: (*a*) comparing the intellectual capacity of different sections or classes in a given school grade; (*b*) comparing the intellectual capacity of the raw human material in different schools; (*c*) studying and determining the general intellectual level of the pupil material for an entire school system or community.

(3) To evaluate and measure the school accomplishment of a pupil, class, grade, school, or school system in the light of their intellectual capacity.

(4) To determine the success which a particular school or school system has attained in adapting its organization and work to the mental inequalities of its students, by comparing their intelligence scores with the progress made in school.

(5) To make social and community surveys; (*a*) for the purpose of ascertaining the nature and value of the human resources of a community or state; (*b*) to locate and study moral delinquents for purposes of special educational or legal treatment, and (*c*) to locate the feeble-minded for special study and educational treatment. A mental survey, if continued over a period of three or four years, would reveal as nothing else could the true character of the human resources of the state — our most valuable asset.

(6) To make industrial surveys for the purpose of con-

serving more fully the human resources and talents in business and industry, by placing each worker more nearly at the right job, or adjusting his occupation to his intellectual interests and mental strength.

Space will not permit us to give more than a brief description of each of these uses, but it is hoped that even such an account may prove helpful to educators and social workers interested in a more economic and efficient solution of the problems discussed.

**1. Making individual diagnosis for grade classification and educational guidance.**

(a) *Locating the brightest pupils in any class, grade, school, or group, for special educational treatment.* The ways in which a mental survey may be used to locate any superior group of individuals for special educational treatment have already been pointed out. (See Chapter IV, pp. 42-45.) By the use of reliable intelligence tests the most superior individuals in any class, grade, school, or group may be located and arrangements made for the kind of educational treatment that is best suited to their intellectual interests and capacities. Group intelligence tests are available which may be given to pupils in any school grade, or to college students or adults, and to a class of 25 or 300 at a time. These will enable any teacher to determine in from 25 to 45 minutes which individuals in the group possess the highest or lowest grades of intelligence, as well as to locate specific groups of individuals ranking between the highest and lowest divisions of the total group. When mental age and grade norms have been established the value of these various grades of in-

telligence may be determined and a more economic and profitable educational treatment prescribed for these various groups.

(b) *Prognosticating school success.* Intelligence tests and mental surveys are also of special value for determining the probable school success which a particular student, class, grade, or group may attain. The ability to learn, as revealed by a reliable intelligence test, is the best single criterion we have for determining what may reasonably be expected in the way of school attainment from an individual or group of individuals. This measure may, therefore, be used, with certain restrictions, as a basis for the classification and promotion of pupils in school in the following ways: (1) The brightest individuals in any class may be doubly promoted or allowed to skip a half or whole grade, or even put in the school grade where their intelligence scores indicate that they belong. (2) They may be put in a special opportunity class, with pupils from other grades or buildings, where they can be given special educational treatment adapted to their superior ability. This would enable a teacher not merely to allow such superior individuals to finish the work of the ordinary course as rapidly as possible but would provide an opportunity for experimenting with the course of study and the type of instruction best adapted to the needs of such superior pupils. Less detailed work, less drill, and fewer reviews are doubtless necessary for such superior students. In fact, there is every reason to believe that both the course of study and type of instruction should be sharply differentiated for a class of such individuals.

(3) The pupils of a given grade or school may also be grouped into sections or classes on the basis of mental strength as determined by the mental survey, and the whole matter of their instruction put on a more economical and efficient basis. (4) The mentally deficient individuals in a class or school may be readily located and segregated for special educational treatment. (5) Mental tests are also helpful as an aid to promotion. They show whether or not a given pupil has the ability to do the work of the next higher grade because they show what may reasonably be expected from doubtful students.<sup>1</sup> (6) Intelligence tests also indicate the causes of school failure and assist in placing children who come from other systems, or from a country to a city school. Children from other schools and states are often wrongly placed in the new system, being usually assigned to a lower grade than their ability and past training really warrant. Intelligence tests help to make a proper adjustment.

Two years ago in a certain Indiana school system near a large cantonment the superintendent had the task of grading 600 children who came from every section of the United States. Inadequate records, different standards, the different courses of study and textbooks which had been used and the fact that the entire job of classification had to be done in a few days at the opening of school made his task extremely difficult. Appeal was made to intelligence tests and to the age and grade norms which had been previously established for his system on the Indiana Uni-

<sup>1</sup> For a discussion of the limitations of group intelligence tests, see Chapter XIV, section 9.



versity Group Intelligence Scale. As a result the pupils were soon correctly classified for effective work.

(c) *Vocational guidance.* As has already been shown, intelligence tests and the results from systematic mental surveys may be used to prognosticate not only the kind of success which a given individual may attain in school, but also in life. By means of reliable intelligence tests we may ascertain the occupations or lines of work in which an individual with a given grade of intelligence might be expected to succeed and the callings that are clearly unsuited to his mental strength. Intelligence tests may therefore be made a first step in the successful vocational and educational guidance of youth and are needed far down in the grades, contrary to the opinion of most educators.

As far down as the fourth and fifth grade pupils begin to drop out of school. For these individuals some factual basis is needed to direct not only their future education, but their choice of occupation, because it becomes necessary to do both as soon as it is apparent that they can no longer profit by the traditional school course. They must at this time, if ever, be given educational work adapted to their mental capacity and future vocational needs. This is absolutely necessary if their education is to be directed in ways that will be most interesting and helpful to them. They cannot profit by or become interested in the traditional school course because they lack the native mental ability to do the work.

We can only speculate on the amount of social waste which occurs from the fact that such individuals have not been directed *towards* or trained *for* the lines of work

adapted to their mental capacities and interests.<sup>1</sup> Because of inadequate vocational guidance many men and women are to-day engaged in occupations far beneath the level of their intellectual ability. Others are attempting work too complex for their mental strength. Both are made unhappy and inefficient because of the ill-adjustment. And a bad matter is made worse when young people are trained in our professional and vocational schools for life careers wholly unsuited to their native mental strength. Systematic mental surveys would do much to correct such social wastes. If intelligence tests were given to workers now engaged in the various standard occupations, we would obtain intelligence norms which would show the grade of intelligence that the workers in each important field of work actually possess and, therefore, the intelligence levels that are necessary for successful work in the standard occupations. Such norms would at least give us a starting point for effective vocational and educational guidance of youth.

(d) *Educational diagnosis and direction.* But a matter which is just as important as directing an individual towards the work in life which he is best able to do, is to

<sup>1</sup> This situation is made worse by the well-meaning but misdirected efforts of many of our child welfare enthusiasts who busy themselves by getting laws enacted in the different states which force these unfortunate and mentally deficient individuals to continue in school until they are 16 years of age. No provisions are made to adapt the course of study to their capacities or vocational needs. The only hope in such misguided procedure lies in the fact that such laws may in time force school authorities to adjust their school work to the intellectual capacities and needs of those who are thus forced into the school, but who can never succeed with or profit by the regular academic course.

prepare him by education or training to do that work in the most economical and efficient way possible. We must, therefore, learn to determine what, in an educational way, should be done for the individuals belonging to each particular mental class or group. An intelligence score is the best aid which a teacher or parent can have, who must make such a diagnosis or give to an individual the kind of educational guidance which he ought to have. A reliable intelligence rating, more than any other one thing, shows what a given individual can do and what he cannot do successfully, and what direction a given student's education should take. By indicating what may be expected from an individual, we secure help in predicting what ought to be done for him or any group of individuals who vary so tremendously in native mental capacity.

The need for such educational and vocational guidance is apparent to all. It cannot be given to the young people in our colleges and schools without the use of intelligence tests or systematic mental surveys. Such direction or guidance should be given while these young people are still being trained for the duties of life. When we reflect that such intelligence tests may be given to an entire class of 25 to 400 individuals in 30 or 45 minutes and the results scored as quickly as a teacher can grade the results of the ordinary school examination, it is difficult to see why such mental tests are not given more often as regular examinations by the school.

(e) *Determining the causes of failure in school.* Intelligence tests are also an aid in ascertaining the causes of failure in school, because they enable a teacher to deter-

mine whether such failure is caused by the absence of intellectual capacity or by poor teaching and inability on her part to reach and interest her students in the work.

**2. Determining the success or adjustment of a school to these individual differences.** The best, and so far as the writer knows, the only systematic way in which a superintendent can determine the extent to which his schools and teachers are succeeding in adapting themselves to individual differences in the native mental endowment of their pupils, is by means of intelligence tests or mental surveys. This may be done by determining the grade of intelligence which the pupils possess who have actually been accelerated or retarded by the school. Such questions as the following would naturally arise while making such comparisons. How does the intellectual ability of those accelerated by the school compare with that of the group which has been retarded or only normally promoted? Are some pupils advanced faster than their mental ability seems to warrant and others held back who really should have been advanced? Are the brightest pupils advanced as rapidly as their mental ability warrants? Are the duller students promoted along with the brightest or even ahead of some of them? If so, what is wrong?

A mental survey is therefore needed to show how well a school is adjusting itself in organization and work to the individual differences and needs of its students. If the brightest students are not making good grades on their school work, the reasons for such failure should be determined and the proper adjustments made. A careful study



should also be made of the "over-ageness and under-ageness" of each pupil in the school. In schools where careful and thorough mental surveys have been made we regularly find that the brightest pupils have not been advanced by the school as rapidly as their mental ability seems to warrant, while the dullest pupils have, as a rule, been advanced more rapidly than their mental ability indicates that they should be. That is to say, it is the brightest children who are really retarded, because they are found to be from one to three years behind the grade to which their mental ability indicates that they should belong.

Intelligence tests and mental surveys will, therefore, enable school authorities to approach the study of retardation from an entirely new and scientific angle. Viewed in the light of the individual differences in mental endowment which are known to exist, the problem of retardation presents an entirely different situation from what is usually supposed to exist. The problem needs to be approached from the angle of what may reasonably be expected from individuals who possess given grades of native mental endowment, rather than by judging each pupil's school standing on the basis of mere chronological age or by standards which disregard the native mental ability of the students whose work is being evaluated.

**3. Making group diagnoses to determine mental differences between classes, grades, schools, and groups.** Intelligence tests may also be used to determine and study class, grade, school, and community differences. It has been found that marked differences exist between

the intellectual capacity of children who belong to different sections of the same school grade, or who attend different buildings in the same city, or between children living in different cities or in different sections of a county or state.

Reliable group scales of intelligence will enable a superintendent first of all to compare the intellectual capacity of different sections or classes in the same school grade and so to determine what may reasonably be expected from a given class or grade. In this manner the work of a teacher may be properly evaluated. Without such intelligence records all sections or classes must be judged by the same standard. This, in the light of the group differences which have been shown to exist, would be a manifestly unjust and inaccurate procedure. Such tests may also be used to study the intellectual capacity of the human material found in different schools belonging to the same system or for determining the general level of intelligence of the pupil material for an entire community.

In this way any superintendent with the aid of a group scale for measuring intelligence may obtain a real factual basis for comparing the accomplishment of his own system with that of any other system; for evaluating the work of any particular teacher or the results obtained by the teachers in different buildings, etc. We no longer should evaluate school accomplishment for a particular class or section, or the success of teachers in a particular building, or the work of an entire school system by mere objective standards of achievement which do not take into account the mental capacity or "learning index" of the pupils concerned. The actual school accomplishment should be

judged in terms of what is possible, as well as what is desirable.

Intelligence tests may, therefore, become not merely an instrument in the hands of a teacher or superintendent for making proper adjustments to such class, grade, school, and community differences as actually exist, but a means for the just evaluation and proper measurement of the results of their work.

**4. Intelligence tests needed to evaluate and measure school accomplishment.** Intelligence tests and mental surveys are necessary for determining the type and amount of progress which a given pupil, class, grade, school, or school system should make. The intelligence score indicates the school progress which such an individual or group should be expected to make and so is necessary in *evaluating* the progress in learning which is actually taking place. In evaluating the work of a teacher or measuring the actual success which has been achieved we must combine the results obtained from achievement tests with the results obtained from mental surveys and learn to judge what *is*, in the light of what *may* be, or what *ought to be* expected from a pupil or class possessing the type and grade of intellectual ability revealed by the mental tests. It is not only unjust but pedagogically inaccurate or wrong to judge the results obtained by a pupil or teacher without regard to what *can* and therefore, *ought to be* achieved. Intelligence tests and the mental survey may become a means for the proper evaluation and measurement of school accomplishment, and a technique or method should be worked out which will enable teachers

and superintendents to use achievement tests and intelligence tests together and so measure the results of teaching in the light of what can and ought to be accomplished.<sup>1</sup>

**5. Making social and community surveys.** Intelligence tests and the mental survey may also be used to determine the character and value of the human resources of a given community or state. By means of mental surveys we may take stock, as it were, of the human resources of any community. Such a survey might be made in the public schools because this would probably give a true picture of the intellectual level of the adult population of the community. It might also be made a means for locating actual and prospective moral delinquents and feeble-minded, if the special cases so differentiated were given an individual examination of a more searching and exact character. Such social and community surveys might be used: (a) to locate for purposes of further study and special social and educational treatment prospective and actual moral delinquents; (b) to locate the feeble-minded for further study and special educational treatment; and (c) to make an inventory of the human resources of a community or state. The first two uses named should be more fully described.

(a) *Location and treatment of moral delinquents.* Intelligence tests are especially valuable for determining what sort of re-education should take place in our treatment of moral delinquents. Crime is often the result of mental

<sup>1</sup> Such a program of research has been undertaken in our own laboratory. School achievement tests are being developed which may be readily combined in this way with group intelligence tests.



deficiency. Intelligence tests would indicate the general level of intelligence of this delinquent group and would therefore show to some extent the source of the moral delinquency. They would at least indicate the sort of re-education that was needed for this group of adults. If systematic mental surveys were given in the schools, we would be able to isolate for special case study many of the individuals who would later drift into this criminal class, and by making a special study of these individuals the problem of dealing with this delinquent class would be met at the source and by means of special educational treatment and training in habit formation, which would naturally be injected into our treatment of these individuals, we might prevent the development of those vicious innate tendencies which make this class a menace to society. We would at least secure a real factual basis for dealing with the problem at its inception.

(b) *Location and treatment of the feeble-minded.* One of the most important functions of the mental survey is to locate those who possess the most inferior grades of intelligence found among the individuals of any unselected group. By means of group intelligence tests these individuals may be located in the same manner that those possessing the most superior grades of intelligence for their age were identified. By further individual examinations the degree of mental deficiency may be accurately determined and a true basis established for educational treatment. This would give to the superintendent a proper basis for determining both the content and method which should be employed in their education.

Intelligence tests not only show the numerous grades of intelligence actually found in any unselected group of individuals, but show that those who fall below a certain level will never be able to succeed with certain types of school work no matter how much or long they try. These should be segregated at once for special educational treatment. The feeble-minded and certain grades of morons should be segregated early not merely for special educational treatment, but also to be protected from the competition of normal individuals and from each other. By such prophylactic measures we shall not merely serve best this unfortunate class, but also protect society from the crime, pauperism, and industrial inefficiency which can be traced directly to this class of individuals and to the fact that they have not been properly trained or taken care of. Intelligence tests and the mental survey are the only means by which these individuals may be surely identified and the degree of defectiveness ascertained.

**6. Conserving human talents and capacities in business and industry.** Intelligence tests and mental surveys may also be made a means for the conservation of talents and human capacities in the fields of business and industry. We can only speculate concerning the amount of social waste which results from the fact that the right individual is not in the right occupation. Much social waste could be prevented if employment managers would only try to fit workers to the types of work that are adapted to their intellectual capacities.

For this, intelligence tests are necessary and if followed up by appropriate vocational and trade tests which de-

termine the special mental characteristics and skills required for different lines of work, the employees in any business or industry could in time be placed more nearly in the right vocation than would ever happen as a result of mere chance, or from the operation of the law of the survival of the fittest in different lines of work. And we have said nothing about the enormous gain that would come from the change in attitude which would take place in the minds of workers if in some manner they could always be connected up with a job in harmony with their mental capacity and intellectual interests.

**7. The mental survey and social service.** Lastly, intelligence tests are an aid to social workers because they may help them to understand that great body of individuals who are objects of public charity. Pauperism and vagrancy, even more than crime, result from inferior mental capacity. They are chiefly due to the fact that the individual is unable to compete in the modern economic and industrial world with individuals of average or better grades of intelligence. These less fortunately endowed individuals do not need to be clothed and fed at public expense so much as they need to be protected from normal competition, by training them for some necessary occupation, which is adapted to their intellectual capacity, and one which will enable them to become self-supporting and happy because they have been helped to help themselves. The mental survey may be employed in devising methods of dealing scientifically with this group of individuals: (1) by finding tasks which are adapted to their mental strength. It will help to determine what in the way of

training and dependability may reasonably be expected from individuals with their grade of intelligence. (2) It may be used to determine which occupations require that particular grade of intelligence for successful performance.



## CHAPTER XVII

### NEED FOR SYSTEMATIC AND COÖPERATIVE RESEARCH IN THE HUMANISTIC SCIENCES

1. **Need for coöperation.** For carrying on such systematic mental surveys of a social and educational nature, a program of coöperative research should be carefully planned and pursued through a period of years. A group of specially trained men and women at the universities should coöperate with select groups of teachers, superintendents, and social workers who are in first-hand touch with the problems to be solved. For to deal with the problem of education and social betterment in an efficient and economical way, we must have a more comprehensive and accurate knowledge of the facts that pertain to the problems which are to be solved by those whose business it is to change human nature in accordance with our best ideals. The need for such a comprehensive and systematic program of research is apparent. We are groping too much in the dark with regard to all these important problems and can never make more rapid progress in their solution than that which results from the use of the trial and error method until we have a more exact knowledge of the pertinent facts. A single illustration will make this fact clear.

We do not yet know what, in an educational way, may

reasonably be expected from individuals who vary so greatly in mental ability as those studied in this investigation, and we have no practical methods for measuring school progress in the light of the native mental endowment of school children. In the field of social service and reform we do not know how to prevent crime, how to reform criminals, how to conserve child life and health, because we do not have the facts which enable us to act intelligently with regard to the problems in these fields. Much careful and painstaking research is needed before these and other important problems can be systematically solved.

Such research must, we believe, be undertaken by the universities working in close coöperation with the practical workers in the field, so that the searchlight of science may be thrown upon their problems and the investigations of the specialist at the university sharply directed towards the solution of the practical problems which the workers in the field are called upon to solve. This is not only possible but highly desirable for reasons which follow.

**2. Value of organized effort in research.** It has been shown that man's native mental curiosity, which is chiefly responsible for the success of science and the discovery of all truth, may be harnessed, as it were, or set to work on a *program of research* which requires the labor of many hands and the best efforts of individuals with the most diverse capacities and interests. As was so well shown by our experience in the World War, practical men and scientists, representing various fields of research, may be organized and set to work upon a program of research that will prove immediately helpful for the solution of impor-

tant present-day problems in any field. By such coöperation and concentrated effort results may be obtained far superior to any that are possible by the use of the more spasmodic scientific procedure, which has been the fashion in every department of science up to the present time. This is true for the same reasons that modern business and industry have found such coöperation and organization necessary to achieve the greatest results with the least expenditure of time and effort. It needs only to be remembered that in such a program of research the individual scientists who venture farthest beyond the bounds of the known must be given full freedom for the play of their mental curiosity while working on any particular problem or in such a definitely limited field.

**3. Part to be played by the university.** In any such scheme for coöperative research the university must play the leading rôle. It is in the university that the facts must be determined which will guide the practical workers in the field. The technique for such coöperative work and the methods of research must be developed by a corps of specialists at the university. We need give but a single example and may take it from the field of mental measurements as applied to the problems discussed in the preceding chapters.

Such specialists must devise and verify a method for evaluating and measuring school accomplishment. They must devise methods which will enable teachers and superintendents to determine the causes of school failure. They must devise and verify methods which will enable educators and teachers to measure the progress that is made in

all standard forms of acquisition or learning. They must show how a "vital index" for school children may be determined, and used in adapting the work of the school to their *vital* as well as to their *intellectual* capacity. They should determine how best to cultivate such important mental abilities as attention, memory, the power of correct observation; and devise and verify methods for the measurement of persistence, mental attitude, ingenuity, and other mental characteristics important for success in school and life.

**4. Need for adequate financial support.** Such problems cannot be solved by the practical workers in the field. They must be worked out by a corps of specialists at the university, who are supported by state or federal appropriations or by special and private foundations, sufficient in amount and constant enough in character to enable them to formulate and carry to successful completion extended programs of research. These specialists must also take the lead in directing the work of teachers, superintendents, and social workers who are to make *their* contributions by applying the facts so discovered and by trying out in their mental and social surveys the methods and technique which have been devised by the scientists at the university.

**5. Scales and materials now available for making such systematic school and community surveys.** For making such school and community surveys as we have suggested in the preceding chapters, reliable methods of measurement with appropriate scales for such measurements have already been developed. A group scale for



measuring the intelligence of school children, applicable both to the elementary grades and to high school, has been developed by Drs. S. L. Pressey and L. W. Pressey, Research Assistants in the Department of Psychology at Indiana University; and "school attainment" tests in the fundamental school subjects to be used in conjunction with these intelligence tests for the evaluation of the work of teachers, classes, or schools are also being developed and tested.

A group point scale of intelligence adapted to measuring the intelligence of pupils in the first three school grades and learning or achievement tests devised to evaluate and measure the progress made in reading, spelling, and the fundamental arithmetical processes to be learned in the elementary grades have already been prepared. These may be obtained from the Department of Psychology, Indiana University, at cost of printing and handling. As a matter of fact, the present investigation is only one of a series of studies that have been undertaken in the field of mental measurements at Indiana University. Two research assistants are devoting their entire time to devising methods and technique for the solution of important educational and social problems in the field of mental measurements as well as giving help to superintendents, teachers, and social workers in the use of the materials and methods worked out in our own and other laboratories.

A number of other reliable group intelligence scales are also available for making such mental and social surveys. Among these should be mentioned the Otis scale, the Hag-

gerty scale, the Terman Group scale, the Meyers scale, the Pintner scale, the Dearborn scale, and the National Committee scale. Most of these may be obtained from the World Book Co., Yonkers, New York. For detailed individual examinations and case study the Stanford Revision of the Binet scale and the Kuhlmann intelligence tests are on the whole the best.

A similar service to that described above, for mental testing, is being organized by our laboratory for industry and business. That is to say, psychological methods are being devised and applied to the more important *human* problems encountered in these fields. A similar program for coöperative research might be planned for a number of other fields of human activity where psychological laws and principles are an important factor in conditioning human affairs. This is particularly true in the field of child welfare work.

**6. New science of human engineering possible.** In some such manner a real science of human engineering may be developed which would have for its goal the betterment of the race and the discovery of such facts as would enable us to cultivate and improve all of man's abilities. In the past, scientific endeavor has been directed chiefly towards the discovery of facts that would enable us to understand and improve the physical conditions under which man must live and work. It is time that we directed our scientific work towards problems whose solution would enable us to improve the race itself. If comprehensive methods of research in this field were wisely planned and systematically carried out, we would soon be able to deal on a factual

basis with many things about which we can at present only dream, because science would be harnessed, as it were, and made to do service in showing us how human nature itself might be changed in accordance with the highest ideals we hold concerning the possibilities and purposes of human life in the world.

**7. General conclusion.** What is needed to-day is more and better trained workers for such programs of coöperative research as have been suggested above, and adequate financial support to carry on the work. The best things in the world have not yet happened. The best history remains to be written. Science, particularly the humanistic branch, is only in its infancy. The man who thinks that the most important discoveries have been made is intellectually blind. What is needed is a clearer vision of what can and ought to be done by means of systematic research; a greater willingness on the part of those who have been specially trained for scientific work to coöperate among themselves and with the practical workers in the field on important programs of research; and sufficient financial support to stimulate the best young men and women in each state to elect and prepare for a scientific career.

If this study of the intelligence of high school seniors has made only a slight contribution to that body of facts which, when fully determined, will enable us better to conserve our human resources and talents; or if it will but help to stimulate those who can and should coöperate in such humanistic research; or if it will suggest to those who have the means to support or endow such scientific

work, that such support constitutes one of the greatest opportunities for permanent social service that is to be found in the world, the fondest hopes of the writer will have been realized.





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